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WAR DEPARTMENT

TECHNICAL MANUAL

REEL UNITS RL-26 AND RL-26-A

August 21, 1941



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REEL UNITS RL-26 AND RL-26-A

Prepared under direction of the
Chief Signal Officer

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SECTION I

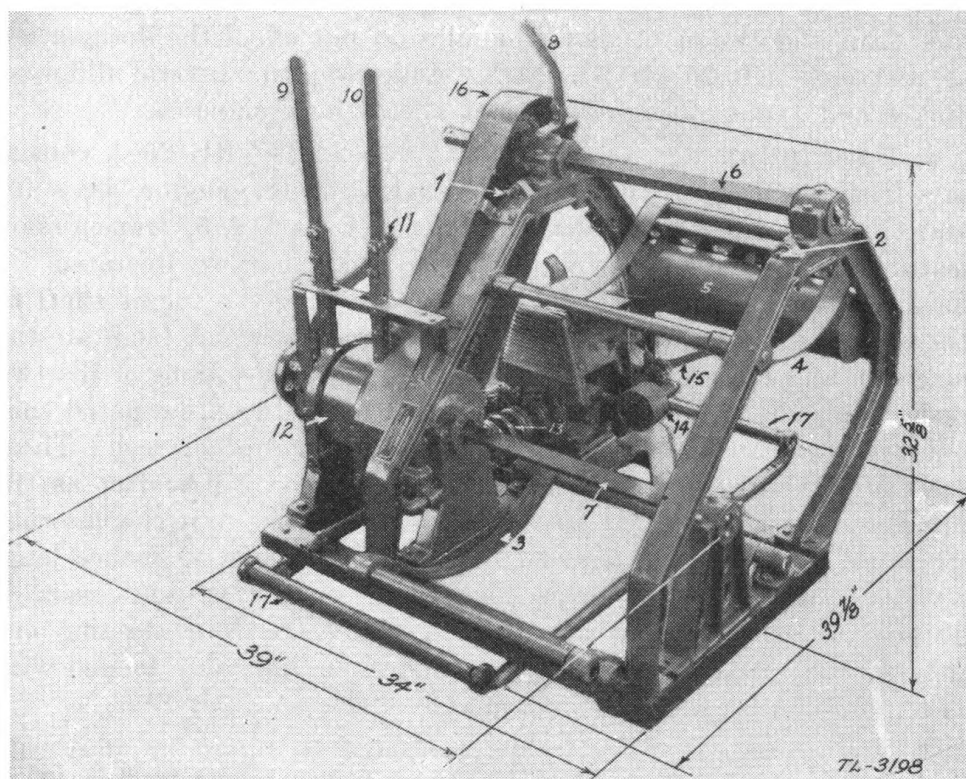
GENERAL USE AND DESCRIPTION

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1. Purpose.—Reel units RL-26 and RL-26-A are transportable wire-laying and wire-recovering machines intended primarily for either temporary or permanent installation in motor trucks. They can be operated while the vehicles are stationary or in motion. Dis-

mounted, the units can also be operated in temporary fixed positions on the ground.

2. Characteristics.—*a. RL-26.*—All component parts of the reel unit RL-26 are assembled on a skid frame which can be installed quickly in the back of a vehicle. The capacity of the unit is two reels DR-5, each containing one mile of wire W-110 (or its equivalent)



- 1 and 2. Bearing adjustment screws.
- 3 and 4. Loading cradles.
- 5. Fuel tank.
- 6 and 7. Axles for reels.
- 8. Secondary clutch lever for upper axle.
- 9. Main clutch lever for lower axle.
- 10. Main clutch lever for upper axle.

- 11. Secondary clutch for lower axle.
- 12. Clutch drum.
- 13. Flexible coupling.
- 14. Air cleaner.
- 15. Fuel line.
- 16. Chain guard.
- 17. Skid frame.

FIGURE 1.—Reel unit RL-26.

mounted in position for paying out or reeling in the wire. The individual reels are readily replaceable. The wire can be payed out from either reel singly or from both simultaneously, and means are provided for braking the individual reels to prevent overspinning. The wire can be reeled in on either reel singly or on both simultaneously at six miles per hour. It can also be reeled in on either reel by means of the hand crank when the engine of the RL-26 is at rest. The skid

and the framework are drilled with holes which permit the unit to be secured to the floor of a truck by means of bolts or lag screws. Figure 1 shows the reel unit RL-26 without the reels.

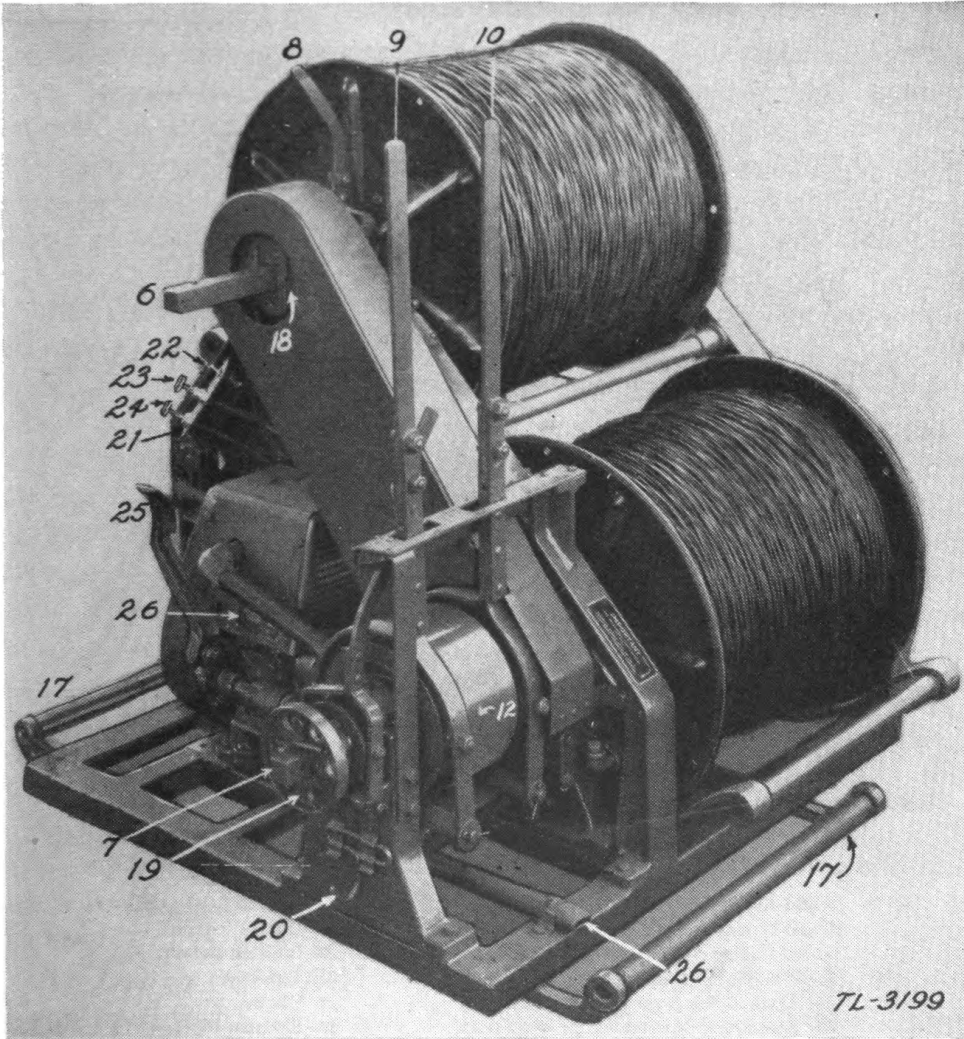
b. *RL-26-A*.—This reel unit is identical with the RL-26 except that it is supplied with a waterproof canvas cover BG-68. Only the addition or removal of the cover BG-68 changes the designation. Minor differences in the covers and guards and the design of the fuel tank and the main clutch handles do not affect the designation as reel unit RL-26 or RL-26-A. Likewise, the several different makes and types of engines do not affect the designation.

3. Description (fig. 1).—Reel units RL-26 and RL-26-A consist of a framework upon which are mounted a gasoline engine, axles (6) and (7) (also called "reel shafts") for two reels DR-5, transmission features incorporating certain clutches which can be operated by means of hand levers (9) and (10) for connecting the engine shaft to the reel axles, and two loading cradles (3) and (4) which facilitate the insertion and the removal of reels. The relative locations of the two reels, upon installation, are shown in figure 2. It will be noted that one reel is located to the rear of and above the other reel. These reels and their respective axles will be referred to hereafter as the upper reel or axle and the lower reel or axle. The unit is somewhat irregular in shape, but over-all it is approximately 40 inches long, 39 inches wide, and 33 inches high. Its weight, without reels, is approximately 346 pounds. Since one reel DR-5, containing one mile of wire W-110, weighs 170 pounds, the unit fully loaded with two miles of wire weighs approximately 690 pounds.

4. Frame (fig. 1).—The frame consists of an aluminum alloy base and two aluminum alloy side members. A skid frame of pipe (17) is attached to the under side of the base to facilitate handling. The side members are bolted to the base and are braced across their upper portions at two places. The shape of the frame is such that the unit will not be obstructed by the rear wheel guards in trucks where the wheel guards project into the truck body proper. The frames on units of recent procurement are drilled so that the Lauson and the Briggs and Stratton engines are interchangeable.

5. Reel axles and bearings (figs. 1, 3, and 14).—The reel axles (6) and (7) are designed to receive and drive the reel DR-5. These axles are provided with dirt-proof bearings in which the actual bearing surfaces are entirely inclosed. The axle is inserted through a square hole in the bearing, through the square hole of the reel, and through the opposite bearing, after which the axle is held in position by means of a spring-operated latch which engages a recess in the square axle

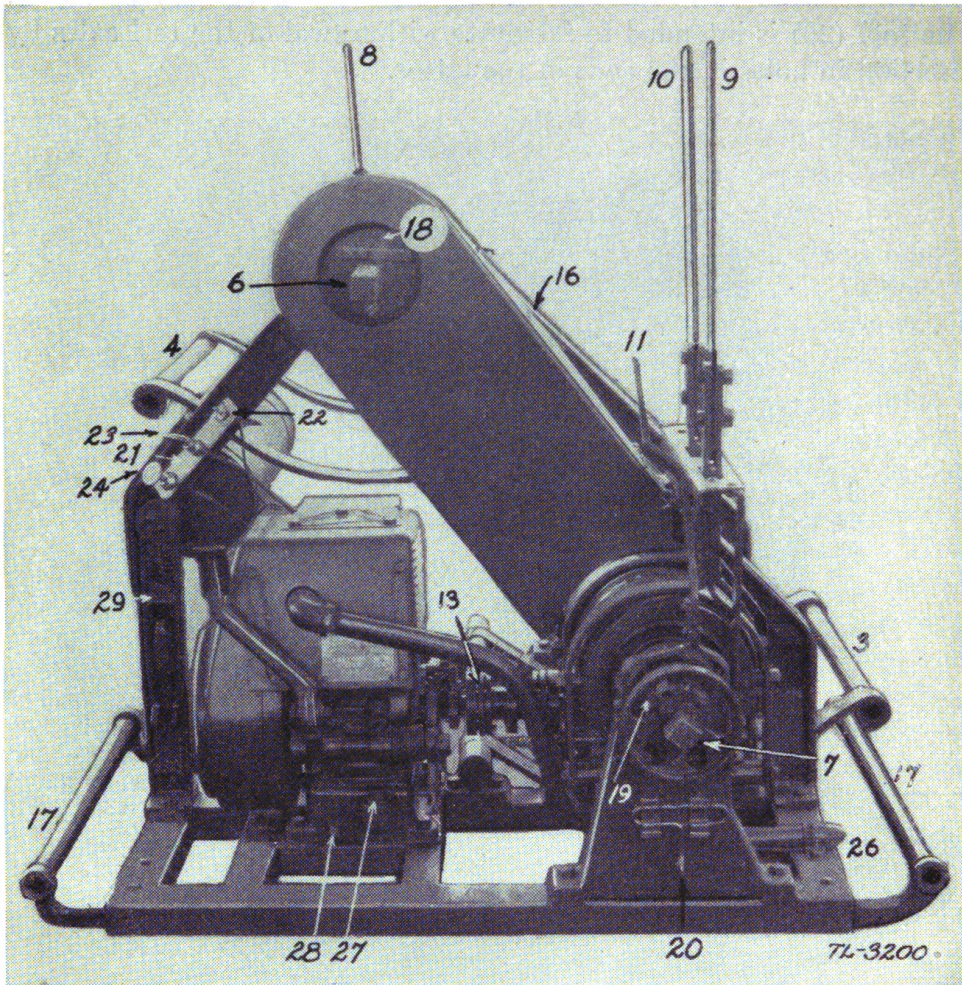
shaft. The axle is tapered at one end so as to facilitate insertion through the various square holes. In removing either reel axle it is necessary to disengage the latch while withdrawing the axle. The latches referred to are shown in figures 2 and 3 as (18) and (19). The tool (20) is intended to facilitate withdrawal of the reel axles by insertion in holes in the ends of the latter.



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| 6 and 7. Axles for reels. | 20. Axle tool. |
| 8. Secondary clutch lever for upper axle. | 21. Control panel. |
| 9. Main clutch lever for lower axle. | 22. Ignition switch. |
| 10. Main clutch lever for upper axle. | 23. Throttle. |
| 12. Clutch drum. | 24. Choke. |
| 17. Skid frame. | 25. Pedal starter. |
| 18 and 19. Axle latches. | 26. Exhaust pipe. |

FIGURE 2.—Reel unit RL-26 with reels DR-5 installed.

6. Transmission (fig. 1).—The gas engine drive is connected to the reel axles by means of a transmission system in which are incorporated a main clutch and a secondary clutch for each reel. (See



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| 3 and 4. Loading cradles. | 20. Axle tool. |
| 6 and 7. Axles for reels. | 21. Control panel. |
| 8. Secondary clutch lever for upper axle. | 22. Ignition switch. |
| 9. Main clutch lever for lower axle. | 23. Throttle. |
| 10. Main clutch lever for upper axle. | 24. Choke. |
| 11. Secondary clutch lever for lower axle. | 26. Exhaust pipe. |
| 13. Flexible coupling. | 27. Oil filler plug. |
| 16. Chain guard. | 28. Drain plug. |
| 17. Skid frame. | 29. Crank. |
| 18 and 19. Axle latches. | |

FIGURE 3.—Side view of reel unit RL-26, showing Lauson engine.

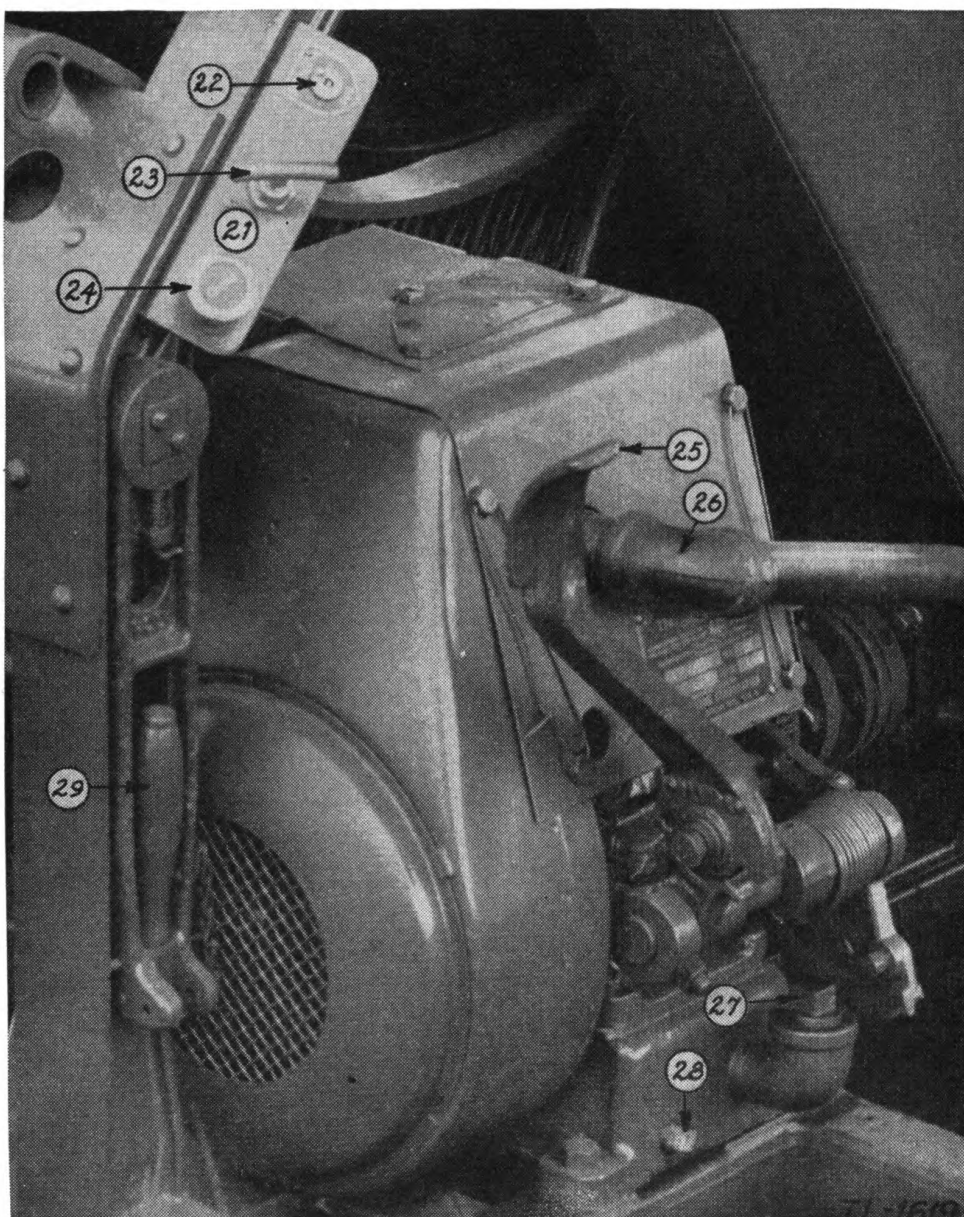
sec. III for details.) Figure 1 shows the levers controlling the main clutch, upper reel (10); main clutch, lower reel (9); secondary clutch, upper reel (8); and secondary clutch, lower reel (11). The main

clutch levers and the upper secondary clutch lever may be collapsed or removed for shipment.

7. Gasoline engines.—*a. General.*—The reel units RL-26 and RL-26-A are equipped with either a Lauson or a Briggs and Stratton engine, or in the future they may be equipped with other engines which are at least equal to these engines. The engines are interchangeable, the frame being drilled to receive them and the shafts being in line with the coupling. Some of the old RL-26 frames are not drilled for the Briggs and Stratton engine, but they should be so drilled, especially if an organization is equipped with reel units having both kinds of engines, in order to facilitate maintenance. The engines are provided with a name plate giving the name of the manufacturer, the model, and the serial number. The engine weighs approximately 73 pounds. The fuel tank (fig. 1 (5)) is special and is mounted on the reel frame rather than on the engine. The tank is connected by an oil proof rubber fuel line (15). A cut-off valve is installed in the fuel line at the tank. The fuel capacity is approximately 2 gallons. The fuel tank on recent units has been improved, the fuel line being attached near one end instead of being attached near the center of the tank, and a gasoline filter is combined with the cut-off valve. Instructions for the care and maintenance of the engines are contained in section II. However, before attempting to start the engine, observe every precaution regarding lubrication as set forth in paragraph 11*d*. A control panel (21) is mounted on the frame of the unit (figs. 2, 3, and 4). In the figures the ignition switch is (22), the throttle is (23), and the carburetor choke is (24). The throttle and choke controls are operated by pulling out to accelerate or choke, respectively. The throttle control may be set in any desired position by a slight turn of the control handle in a clockwise direction.

b. Lauson engine.—Two types of this engine, manufactured by the Lauson Corporation, New Holstein, Wis., have been used. The more recent engine, RAY-885, has several refinements and improvements.

(1) *Lauson engine RAY-843.*—The engine RAY-843 (figs. 2 and 4) is equipped with a mechanical foot pedal starter (25), a Wico magneto, and a Donaldson air cleaner. The conventional muffler has been replaced by an equivalent pipe section (26). An air-driven governor is installed in the ventilating system and is connected to the carburetor to prevent speeds exceeding 4,000 revolutions per minute.



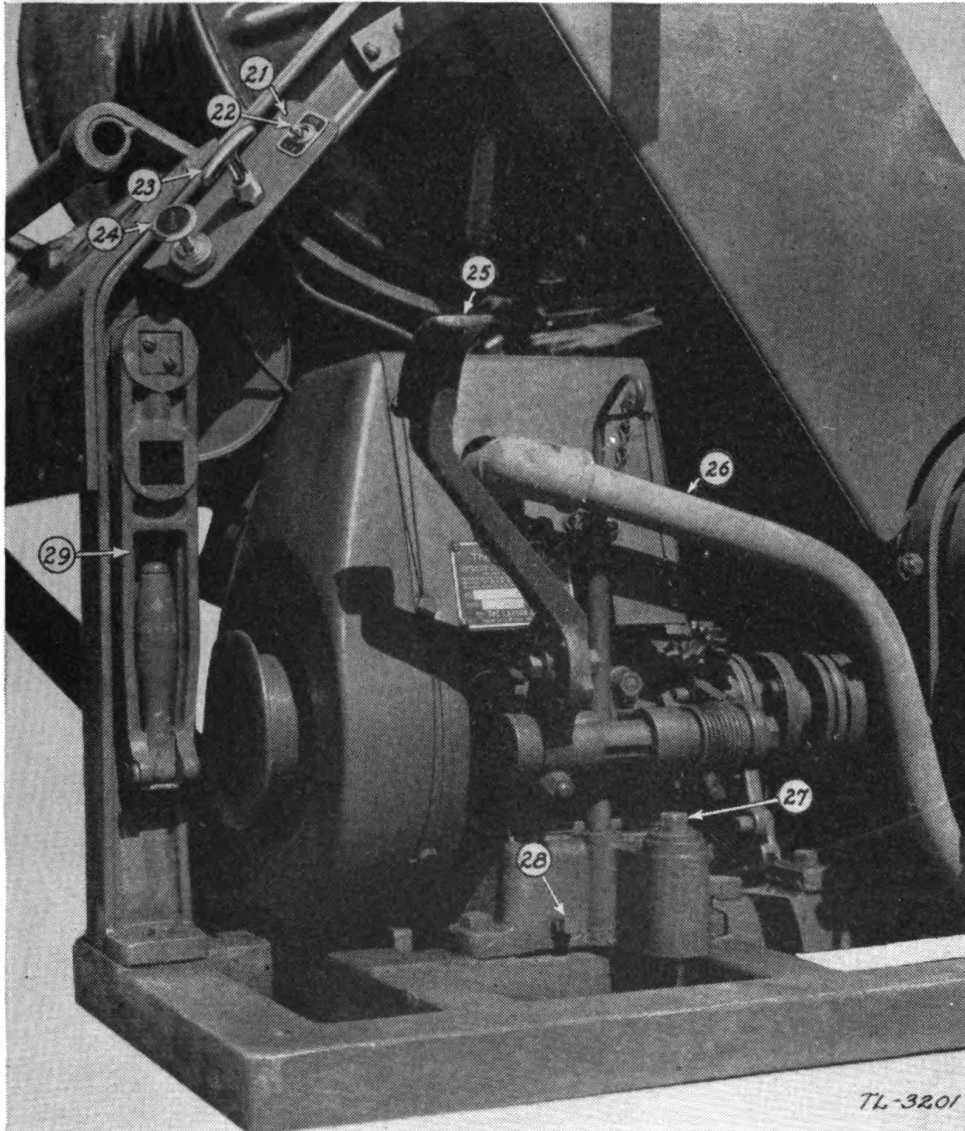
- 21. Control panel.
- 22. Ignition switch.
- 23. Throttle.
- 24. Choke.
- 25. Pedal starter.

- 26. Exhaust pipe.
- 27. Oil filler plug.
- 28. Drain plug.
- 29. Crank.

FIGURE 4.—Lauson RAY-843 engine on reel unit RL-26.

(2) *Lauson engine RAY-885*.—The engine RAY-885 is equipped with a mechanical foot pedal starter, an Eisemann magneto, a Tillotson carburetor, and a Donaldson air cleaner. Other refinements and improvements are: a pulley for rope starting, covers or guards for

the carburetor and the spark plug, and a mechanical speed-limiting governor. The exhaust pipe has been modified and is now equipped with a Hayes muffler or equal to reduce the exhaust noise to a minimum compatible with the specified engine output.



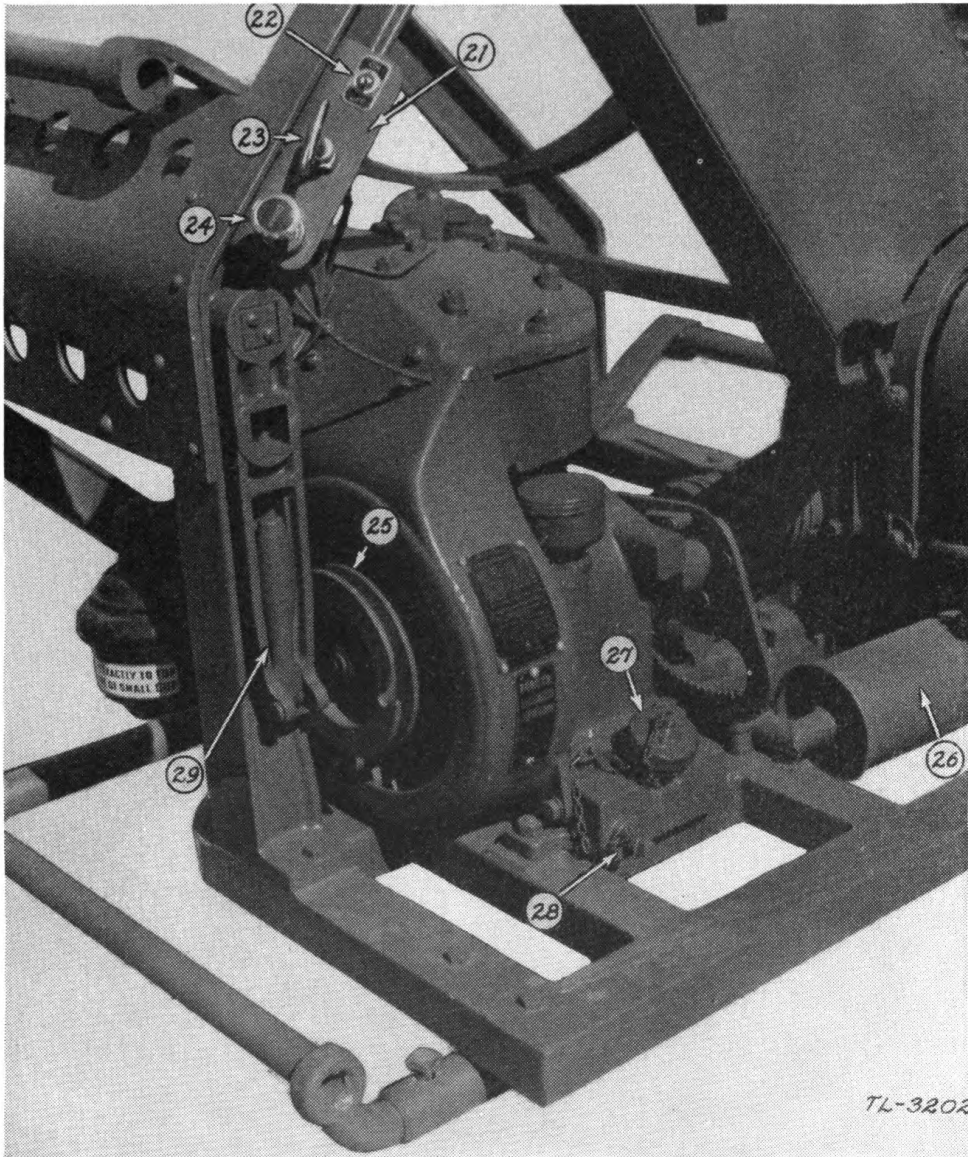
- 21. Control panel.
- 22. Ignition switch.
- 23. Throttle.
- 24. Choke.
- 25. Pedal starter.

- 26. Exhaust pipe.
- 27. Oil filler plug.
- 28. Drain plug.
- 29. Crank.

FIGURE 5.—Lauson RAY-885 engine on reel unit RL-26.

c. Briggs and Stratton engine, model A, No. 208,072.—This engine, manufactured by the Briggs and Stratton Corporation, Milwaukee,

Wis., is also standard equipment on the reel units RL-26 and RL-26-A. It is equipped with a mechanical foot pedal starter, a Donaldson air cleaner, and a Nelson muffler. The engine is provided with a pulley



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| 21. Control panel. | 26. Muffler. |
| 22. Ignition switch. | 27. Oil filler cap. |
| 23. Throttle. | 28. Drain plug. |
| 24. Choke. | 29. Crank. |
| 25. Pulley for rope starter. | |

FIGURE 6.—Briggs and Stratton engine, model A, No. 208,072, on reel unit RL-26.

for rope starting, covers and guards for the carburetor and the spark plug, and an adjustable speed-limiting governor.

8. Loading cradles.—Loading cradles (lift assemblies) are provided for both the upper and lower reels. These cradles (fig. 1 (3) and (4)) are intended to facilitate replacement of reels and as an aid to alining the square reel axle holes with the bearings in the process of inserting the reel axle. The reel is placed in the cradle and the cradle lifted by grasping the handle bar until approximate alinement of the bearings and reel hole has been attained, after which the reel axle is thrust into position. The axle tool (fig. 2 (20)) is intended as an aid in withdrawing the reel axles.

9. Cover BG-68.—The reel unit RL-26 when equipped with cover BG-68 is designated as reel unit RL-26-A. Cover BG-68 is made of waterproof, mildewproof, olive-drab duck. It is so constructed as to cover the entire reel unit and is used for this purpose whenever the

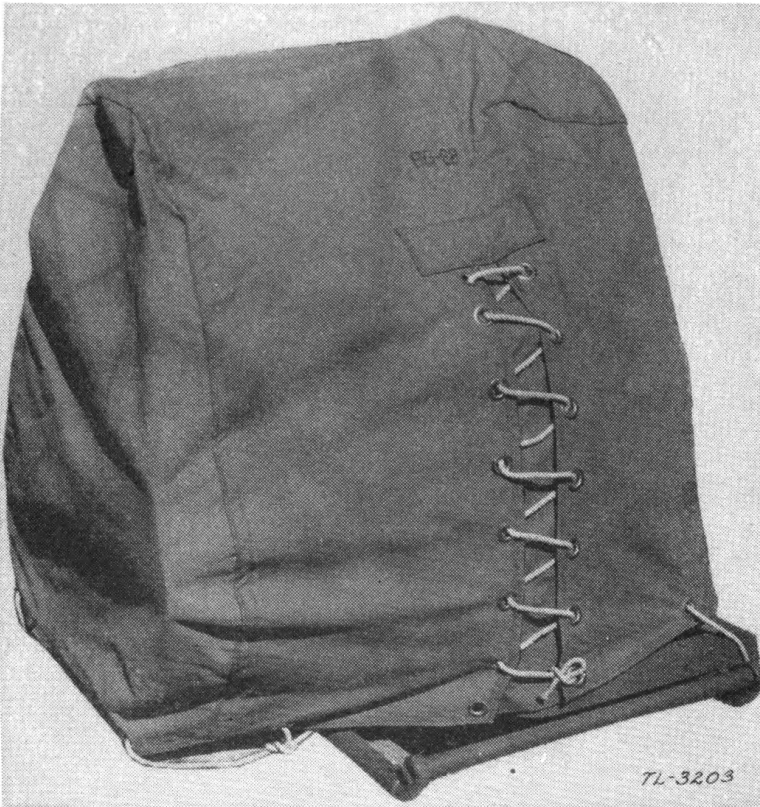


FIGURE 7.—Cover BG-68 in place on reel unit RL-26-A.

reel unit is not in use. Lengths of rope and suitable grommets are provided so the cover may be lashed in position (fig. 7). This operation is performed by first adjusting the cover over the reel unit and lashing the cover down at the rear of the reel unit, then lashing the cover at the four corners to the reel unit base or skid. Care should be

exercised in placing the cover over the reel unit so that the reinforced sections of the cover rest on the top of the main clutch lever and the secondary clutch levers.

SECTION II

EMPLOYMENT

	Paragraph
Installation.....	10
Lubrication.....	11
Operation of engine.....	12
Operation of reel unit RL-26 or RL-26-A.....	13

10. Installation.—*a. Stationary installation.*—A typical ground installation is shown in figure 8. The unit is being used for recovering wire, the gasoline engine being used as a power source. It will be

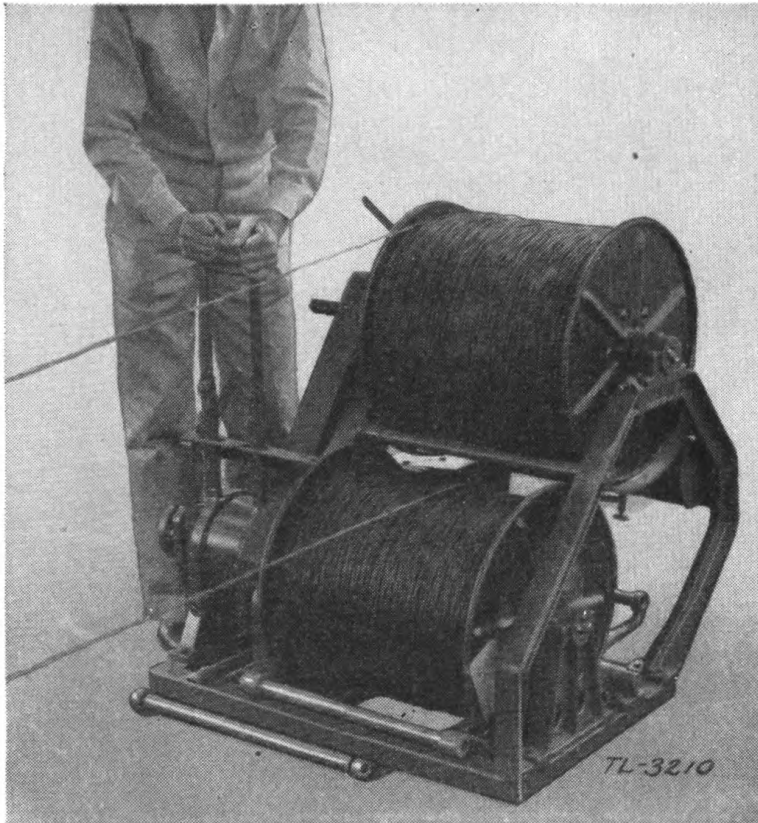


FIGURE 8.—Ground installation of an RL-26.

noted that the operator has both main clutches and secondary clutches engaged and the wire is being reeled in on both reels simultaneously.

b. Vehicular installation.—A typical installation of the unit in a truck is shown in figures 9 and 10. In such an installation the unit

is securely fastened to the floor of the truck or other vehicle by means of lag screws or bolts through the holes provided for that purpose in the base and skid frame. Various other arrangements for fastening the unit securely in a manner to withstand hard road usage will occur to the users.



FIGURE 9.—Laying wire with truck-mounted RL-26.

11. Lubrication.—It is imperative that lubrication of the various moving parts of the unit and of the engine be given frequent attention.

a. The reel axle bearings are equipped with oil cups for lubrication. These cups should be filled with cylinder oil at regular intervals, the frequency depending upon the service given the unit. The viscosity of the oil to be used will depend to some extent on the climate in which the unit is operated.

b. The sprocket chain should be lubricated occasionally with graphite grease.

c. The reel unit transmission (housing an inclosed worm and worm gear) requires particular attention with regard to lubrication. The correct transmission oil must be used and a proper level of this oil must be maintained. In general, the oil required is automobile trans-

mission oil as used in automobiles under comparable conditions. In summer (above 32° F.) use automobile transmission oil SAE No. 160. In winter (below 32° F.) use automobile transmission oil SAE No. 90. Never use an oil thinner than SAE No. 90. SAE No. 90 is recommended for winter use, as a heavier oil, when cold, will impose excessive load upon the transmission and engine, making engine starting difficult.

In figure 11 the transmission oil filler spout is marked (1) and the filler spout plug is marked (2). The head of this plug is painted red.

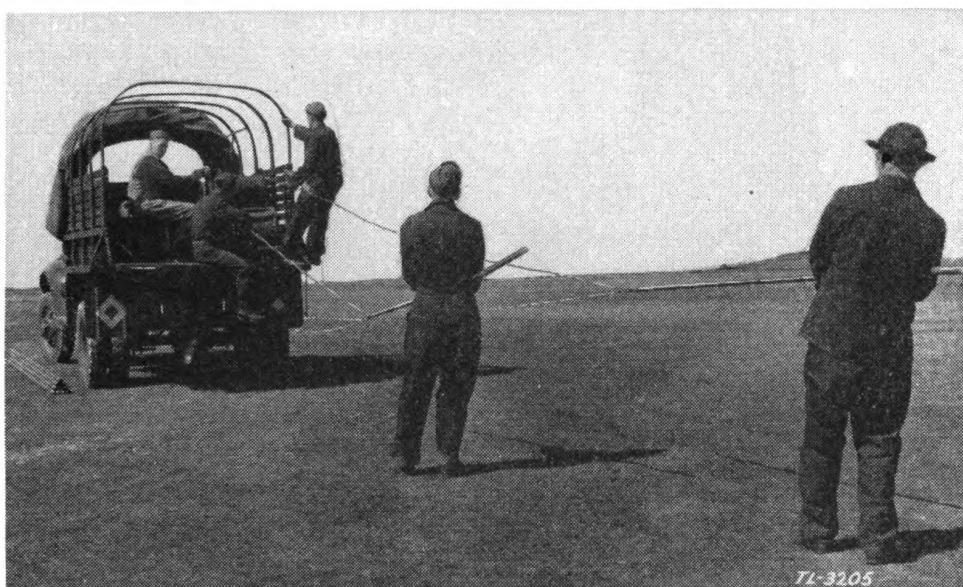


FIGURE 10.—Recovering wire with truck-mounted RL-26.

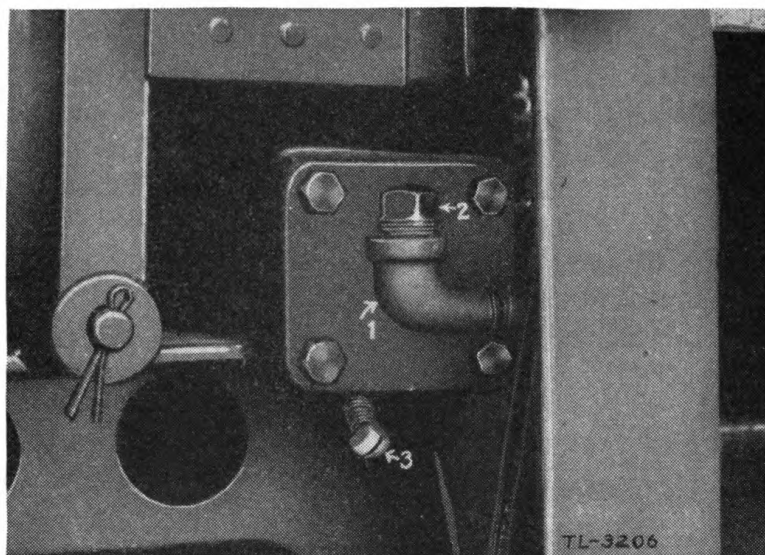
The drain plug (3) is painted blue. The oil must be maintained to a level that can be seen by looking down into the filler spout with the plug removed and the engine not running. The filler plug and drain plug should be firmly in position during operation.

d. The gasoline engine requires the care and maintenance characteristic of all gasoline engines. The most important consideration is correct lubrication. The crankcase has a capacity varying from 1 pint to 2½ pints, depending upon the particular type of engine. The oil filler plug is painted red and is shown as (27) in figures 3, 4, 5, and 6. The drain plug (28) is painted blue. The following general rules if strictly observed will insure proper lubrication of the engine (see also par. 21):

(1) Be sure the crankcase is filled up to the filler plug. Each engine is equipped with a plate containing brief instructions for the lubrication of that particular engine. Instructions specifying the kind of

lubricant to be used in summer and in winter are included. The plate also contains directions for the care of the engine in storage. The specific instructions on this plate should be followed, notwithstanding contradictory statements of general nature in this manual which may be intended for different engines.

(2) Inspect oil level frequently during operation, stopping the engine for that purpose. Add new oil as required to maintain the filler spout full. These inspections should occur at least every hour of operation.



1. Transmission oil-filler spout.

2. Filler plug.

3. Drain plug.

FIGURE 11.

(3) Drain and refill with new oil every 25 to 30 hours of operation.

12. Operation of engine.—When starting any new engine, or any engine which has been standing for some time, make the following check-ups:

a. See that there is gasoline in the fuel tank. Use every precaution to prevent dirt of any kind from getting into the fuel, as it will clog up the fuel line screen, carburetor jets, or the filter on units equipped with a filter.

b. See that oil is at the proper level in the crankcase. See paragraph 11 for grade of oil. If the engine has been standing idle for a long period of time, the working parts may have become dry and it is therefore advisable to idle the engine a few minutes before applying the load so that all parts may become properly lubricated.

c. Open the valve in the fuel line and allow the carburetor float chamber to fill. Open the throttle control about one-fourth of the way.

d. Be sure the ignition switch is in the "on" or "run" position.

e. The engine should now be ready to start.

f. Pull the carburetor choke control out to a point where it stops and crank the engine. It will usually start at once. Immediately push the choke down, but pull it back a little to prevent backfiring or popping back through the carburetor until the engine warms up.

g. Never permit the choke to remain closed after the engine starts or when the engine is running. This will cause an excess of raw fuel to be drawn into the cylinder, resulting in dilution of the crankcase oil or possibly stopping the engine due to an overrich mixture. If the engine does not start after two or three turns of the starter, release the choke wire and turn the engine over a few revolutions to draw in an explosive mixture of fuel and air and to clear the cylinder of the overrich mixture. Again pull the choke control out and proceed as before.

h. A warm engine does not require as much choking as a cold engine.

i. Stop the engine by means of the magneto cut-out switch. Never use the carburetor needle valve for stopping.

j. Adjust the carburetor, if necessary, when the engine is under load and warmed up. (See par. 24.)

13. Operation of reel unit RL-26 or RL-26-A.—a. Laying wire.—Assuming that the reel unit has been fastened to the floor of the truck body by means of either lag screws or bolts, remove the individual reel axles and install one reel DR-5 filled with wire in each of the loading cradles. Lift the cradles to the proper height, insert the reel axles, and latch them in place. Disengage both main clutches and both secondary clutches. The reels are now ready for wire-laying operations. To prevent overspinning of the reels, “brake” them by lifting the loading cradles up against the edges of the reels DR-5. The engine should not be running when wire is payed out in this manner. Figure 9 shows a reel unit RL-26 mounted in a truck with personnel in position to control the reels. It will be noted it requires two operators to control the reels when wire is laid from both reels simultaneously if this method of braking the reels is used. If the secondary clutches are engaged, the reels may be braked by using the main clutch levers. Only one operator is required when this method is used. In the field, however, this method is not as good when paying out wire at high speeds as the first method described, chiefly because it puts too much strain on the wires.

b. Recovering wire.—(1) *By engine.*—When it is desired to recover wire using the gasoline engine as a prime mover, first be sure that the crankcase is full and that all instructions have been observed as outlined in paragraph 11. Mount one empty reel DR-5 on each of the axles. Secure one end of each of the two field wires to be recovered to

the two reels, respectively, in such a manner that both wires of each pair will extend outside of the reels DR-5 when they are filled, thus making both ends of each wire of the pairs available for testing purposes. Disengage both main clutches and engage the secondary clutches. Start the gasoline engine as explained in paragraph 12, and recover the wire on either or both reels by performing the following operations in sequence:

(a) Permit the engine to run several minutes before subjecting it to load in order that it may be properly warmed up. Do not race the engine.

(b) Operate the main clutches and regulate the speed of wire recovery by manipulating the engine throttle. A light pressure on the levers is sufficient to hold the clutches engaged.

(c) The successful recovery of wire with the reel units RL-26 or RL-26-A depends to a great extent upon the ability and skill of the operator. A capable and skillful operator will at all times be alert at the main clutch levers and will be in readiness to disengage the clutches and brake the reels, if necessary, in an emergency. He will be so familiar with the position and operation of the various controls that he maintains complete control of the reel unit at all times. He must be especially watchful to safeguard personnel guiding the wire on the reels and those holding the wire loop. The personnel guiding the wire on the reels should be alert to be in readiness to release the wire from their hands or to disengage their hands from the leather handpad or leather glove used to guide the wire if it becomes entangled. The wire must be guided from a position near the reels in an orderly and systematic manner so that it will be wound in reasonably smooth layers across the width of the reel. The personnel holding the loop must maintain sufficient tension on the wire so that it will be wound tightly and that the reels DR-5 will take approximately one mile of wire each. The arrangement and actual method of performing the various duties depends chiefly upon the personnel and equipment available and the particular task at hand, with due consideration of the terrain, the weather, and other factors affecting that particular task. Some ingenuity and initiative on the part of the section chief is not only desirable but is necessary to accomplish properly any wire recovering task.

(2) *By hand.*—In figure 12 the operation of recovering wire on the upper reel by means of the hand crank is shown. The upper reel secondary clutch being disengaged, the operator is turning the axle and reel directly, without the additional load of the sprockets, chain, and main clutch. Therefore, in recovering wire by means of the

hand crank furnished for this purpose, be sure that the secondary clutches are disengaged. Recovering wire by hand is a laborious task and sufficient personnel must be available for frequent relief at the crank. Generally, hand recovery of wire is slow. Care should



FIGURE 12.—Recovering wire on the upper reel of reel unit RL-26 by hand crank.

be exercised to wind the wire as tightly as possible on the reels DR-5 to prevent tangling when the wire is laid. Every attempt should be made to keep the engine in working condition so that hand recovery of wire will be limited. Figures 3, 4, 5, and 6 show the location of the hand crank (29) when not in use.

SECTION III

DETAILED FUNCTIONING OF PARTS

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Secondary clutches.....	17
Sprocket chain.....	18

14. Transmission system (figs. 1, 2, 3, and 13).—The gasoline engine drive is connected to the reel axles by means of a transmission system in which there are incorporated two expansion friction clutches (referred to hereafter as main clutches) and two additional positive splined sleeve clutches (referred to hereafter as secondary clutches).

15. Mechanical coupling.—Tracing this transmission system from the engine shaft, in sequence, the engine shaft is coupled to the drive shaft through a flexible coupling (figs. 1 and 3 (13)), the purpose of which is to permit minor variations in alinement between the two shafts and to provide for the removal and interchangeability of engines.

The drive shaft enters a dirt-proof and oil-retaining gear housing in which a worm is machined as a part of the steel shaft. Ball bearings are provided for the shaft on each end of the worm. The worm engages a bronze worm wheel. The ratio between the worm and worm wheel is 24 to 1; that is, 24 revolutions of the worm result in one revolution of the worm wheel. It is imperative that the gear housing be kept filled to the proper level with lubricant of the correct viscosity as specified in paragraph 11. If this precaution is not observed, the gears will overheat in operation and excessive wear will occur. *Actual gear destruction will result from improper lubrication.*

16. Main clutches.—The worm wheel is directly connected to the clutch drum (figs. 1 and 2 (12)). This drum acts as the driving side of the main clutch and rotates whenever the engine is operating. The main clutch drum is provided internally with two expanding driven assemblies, each contiguous to its own engaging surface or section within the drum. These two driven assemblies are independent of each other. The driven clutch assemblies are identical in construction. Each consists of two semicircular members which may be expanded into engagement with the driving drum by means of two diametrically opposite tapered members which act to wedge apart the semicircular members. The tapered members are manipulated by means of the shift levers (fig. 2 (9) and (10)). One of the driven clutch assemblies is connected through a secondary clutch to drive the lower reel axle; and the other driven clutch assembly is connected to drive

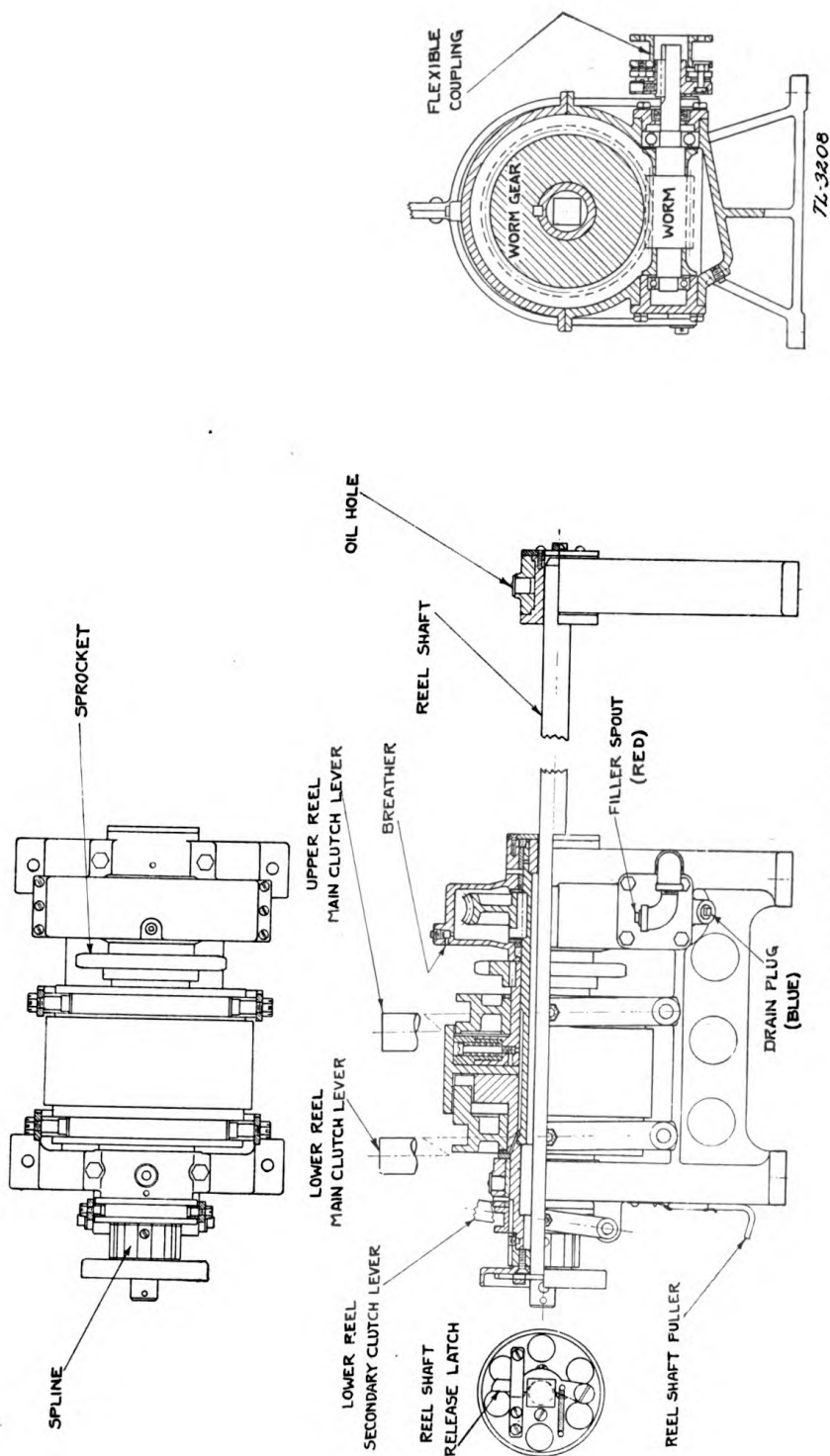


FIGURE 13.—Transmission system of reel unit RL-26.

the upper reel axle through a driving sprocket, a chain, a driven sprocket, and a secondary clutch. A guard or cover is provided for the sprockets and chain (fig. 1 (16)). The lower reel clutch is controlled by the lever (9), and the upper reel clutch is controlled by the lever (10). Figure 8 shows the lever positions for engagement of both clutches simultaneously. For individual operation the same relative position applies.

17. Secondary clutches.—*a.* A secondary clutch is provided for the upper reel axle in order that the load of the chain may be removed from the upper reel axle when hand cranking is necessary. This clutch consists of means for connecting or disconnecting the secondary driving sprocket and the upper reel axle. In reeling in wire by hand crank drive, this clutch should be disengaged to remove the unnecessary load of the sprocket chain and main clutch driven side. When the gasoline engine is used to drive the upper reel axle, the secondary clutch must be engaged. This clutch is positive, as differentiated from friction types, and consists of means for shifting a splined sleeve (an internally keyed or toothed sleeve) into engagement with the driving sprocket hub, or out of engagement with that hub. The splined sleeve transmits the drive to the upper reel axle, or disengages the drive from that axle dependent upon the position of the sleeve (that is, whether in mesh or not in mesh). The position of the sleeve is controlled by the lever (fig. 1 (8)). For smooth engagement the chain should be driving the sprocket.

b. A similar secondary clutch is provided for the lower reel axle, the lever (11) being shown in figure 1.

18. Sprocket chain.—The sprocket chain should be lubricated occasionally as described in paragraph 11*b*. This chain has been adjusted to the correct tension by the manufacturer, but after a certain amount of use it may require tightening. To tighten it, loosen the upper reel-bearing frame bolts and adjust the bearing by means of the set screw (fig. 1 (1)), after which the set screw and bearing bolts should be locked into position. It is imperative that the same operation on the opposite upper reel bearing be performed by means of the other set screw (2), otherwise the two reel bearings will be out of alinement.

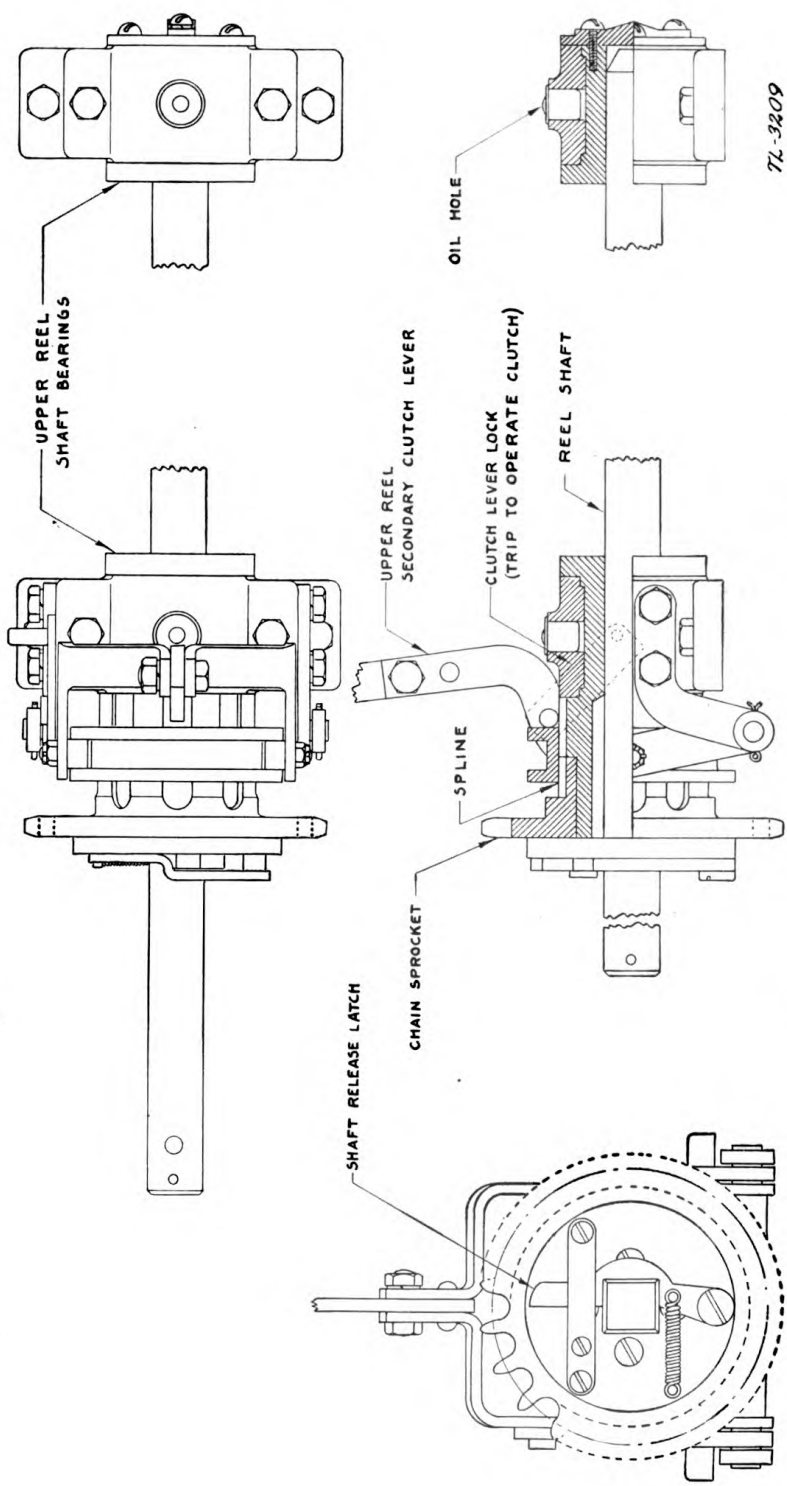


FIGURE 14.—Upper reel secondary clutch of reel unit RL-28.

SECTION IV

SERVICING AND REPAIRING

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19. General.—*a.* Tinkering with the motor or the remainder of the unit should be avoided; this does not mean, however, that a certain amount of service and attention is not required. Keeping the unit clean throughout and providing the right kind of fuel, oil, and grease will be reflected in trouble-free and satisfactory service. The proper operation of the gasoline engine depends upon correct adjustment to provide good ignition, carburetion, compression, and cooling. Of equal importance, of course, the oil and gasoline used must be clean and of the recommended grades. The instructions in this section fully explain the simple adjustments and offer some operating recommendations that will, if followed carefully, assure long and satisfactory service.

b. All references in this section to the Briggs and Stratton engine mean, more specifically, the model A, No. 208,072 engine manufactured by the Briggs and Stratton Corporation, Milwaukee, Wis., and used as standard equipment on some of the reel units RL-26-A.

20. Gasoline.—The use of clean, fresh gasoline of a good grade is strongly recommended. High-test gasoline must not be used; it will form a vapor lock in the fuel line when the engine gets hot and cause

it to stop. Any gasoline containing gum must not be used. The gum content can be checked by evaporating one-half pint of the gasoline in an open dish and noting if a gummy, sticky residue remains. Gasoline containing gum will eventually clog the carburetor, fuel line, and fuel tank, thus causing the motor to stop. A more complete discussion of internal combustion engine fuels is given in TM 10-550.

21. Lubricants.—*a.* For proper engine lubrication a high grade, well-refined oil is essential. In general, the viscosities listed below will be found suitable for varying atmospheric and service conditions for the Lauson engines:

(1) *Summer.*—(*a*) Heavy duty (service involving full load for long periods), SAE No. 30.

(*b*) Average duty (service involving intermittent full loading or sustained partial loads), SAE No. 20.

(2) *Winter.*—(Where engines are exposed to atmospheric temperatures.) Never use a heavier oil than SAE No. 20.

b. It may be necessary under extremely cold conditions, such as where arctic temperatures prevail, to use a lighter oil such as SAE No. 10.

c. A heavier oil than SAE No. 20 should not be used in a Briggs and Stratton engine at any time.

d. The viscosity of an oil is a measure of its body or thickness. The SAE viscosity numbers classify oils according to viscosity but not according to any other property. The company supplying the oil is responsible for the quality of its product.

e. With every filling of the fuel tank also replenish the oil supply in the crankcase of the engine, bringing the oil up to the proper level.

f. The oil reservoir should be kept full to the top of the filler fitting.

g. Do not mix oil in the gasoline. Do not put oil in the gasoline tank.

h. There are no external parts which require oiling. The oil pump in the engine forces oil to all parts requiring lubrication.

i. The rule regarding lubrication of any particular engine is to follow carefully the instructions contained on the instruction plate attached to that engine. This rule automatically takes care of any change in engine or engine design which affects the grade of oil to be used for lubrication.

22. Changing oil.—*a. Draining.*—(1) It is essential that the oil pan be drained and refilled with fresh oil at regular intervals of every 25 to 30 hours of operation. The oil gradually accumulates small particles of dust, grit, and metal which cause wear to the bearing surfaces. The oil is thinned by unburned fuel which passes by the

piston. The crankcase should be drained when the engine is hot. Always allow the crankcase to drain completely.

(2) *Do not flush the crankcase with kerosene or gasoline.* The pockets in the crankcase will trap some of it and this trapped kerosene or gasoline will dilute the fresh oil, impairing the lubricating qualities and possibly causing damage to the engine. Draining the crankcase while the engine is warm will accomplish all that flushing with kerosene or gasoline can do in the removal of sediment. Finally, refill the crankcase with fresh oil of the proper weight and to the proper level.

b. Removing sludge.—The oil in the crankcase also becomes contaminated with sediment resulting from metallic wear, carbon flaking, and grit drawn in through the carburetor when an air cleaner is not used. Under winter conditions, with a cold crankcase, a certain amount of water will collect in the oil reservoir. This is due to condensation of the water in the gases that pass the rings. With dirty oil, this water will form a gummy emulsion and clog the oil strainer and pump valves. If allowed to remain, this sludge will cause trouble. If used oil shows signs of thickening, the engine should be removed from the base and every trace of the formation removed. The oil pump and strainer screen should also be thoroughly washed at this time. Do not use cotton or wool waste for cleaning, as particles from it may stick to the screen and other parts and eventually clog up the oil passages in the lubricating system.

23. Fuel line.—*a. Design.*—Due to differences in design, manufacture, and replacement and maintenance in the field, there are several different types of fuel lines and couplings in use. The aeronautical type fuel line, recognizable by its woven wire protection, is obsolete. Generally, a flexible rubber fuel line equipped with a permanent brass coupling at the carburetor end and a permanent elbow at the fuel tank end is used. This complete assembly should be considered as a replaceable unit and no attempt should be made in the field to separate the rubber tubing from the integral coupling details.

b. Removal and replacement.—If the fuel line is assembled as shown in figure 15, certain threads and nuts *must not* be loosened, otherwise the fuel line will be damaged beyond repair. These particular threads and nuts are distinctly labeled in figure 15. If, however, the fuel line is one of the several equipped with union type couplings attached to the rubber tube by means of a metal ferrule, the union nuts may be unscrewed and the fuel line removed without removing any other parts. Careful examination, while keeping the details of figure 15

in mind, will indicate the type of couplings and the nuts that may be unscrewed without damaging the fuel line.

(1) *Reel units equipped with a Tillotson carburetor.*—If the reel unit RL-26 or RL-26-A is powered with a Lauson engine equipped with a Tillotson carburetor, the following procedure in removing and replacing the fuel line is used: The carburetor strainer head screw should be removed and the strainer with the fuel pipe raised from the carburetor sufficiently to permit unscrewing the carburetor strainer head from the fuel pipe coupling. The fuel pipe can then be unscrewed

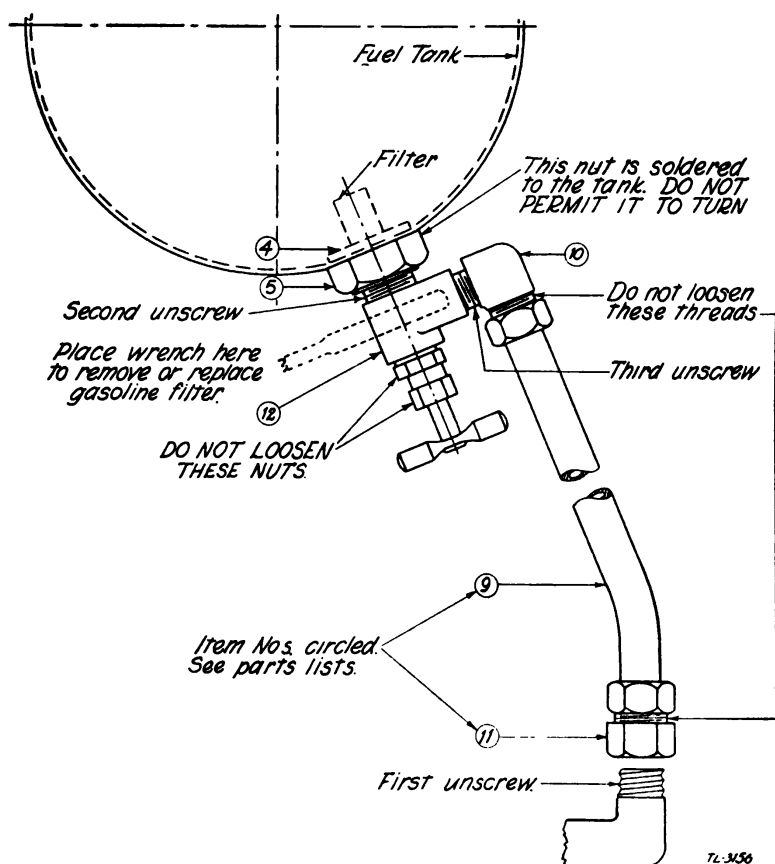


FIGURE 15.—Fuel line assembly.

as a unit from the fuel tank valve (see (3) below) and the strainer head replaced on the carburetor. The installation of a new fuel pipe is made in the reverse order to the process described; that is, remove carburetor strainer head, screw fuel pipe into the tank valve, screw strainer head into the fuel pipe coupling, position strainer head on the carburetor, and lock in place with the holding screw. Care must be taken throughout not to injure the strainer screen.

(2) *Reel units equipped with Briggs and Stratton engines.*—Generally, reel units equipped with Briggs and Stratton engines are equipped with a fuel line having union type couplings which may be unscrewed, permitting the fuel line to be removed directly. However, since a variation from the general case is quite probable, and in the event a unit is equipped with a fuel line as shown in figure 15, the same threads and nuts as are labeled in figure 15 *must not* be loosened. Since the carburetor is of a different design, the procedure to remove the fuel line must be varied. Proceed as follows: Remove the air cleaner and air-cleaner pipe from the carburetor. Remove the carburetor from the intake elbow and then unscrew the carburetor from the fuel line. Unscrew the fuel line and the filter as an integral unit from the fuel tank (see (3) below). To replace or install a new fuel line, reverse the order of the procedure described above.

(3) *Filter.*—All reel units procured on orders dated 1939, and later, are equipped with a Zenith gasoline filter screwed into the fuel tank. This filter includes a valve as shown in figure 15. Due to the physical construction of the filter and the fuel tank, it is impossible to unscrew the fuel line from the filter in place without loosening prohibited connections if the fuel line is as shown in figure 15. Therefore, after the carburetor has been removed from the end of the fuel line it becomes necessary, in order to dismantle the fuel line farther, to unscrew the filter from the fuel tank. This must be done by placing a wrench on the body of the filter unit and turning in a counterclockwise direction. The large nut adjacent to the fuel tank (fig. 15) *must not* be turned or *permitted* to turn when removing the filter. If the filter unit is tight, requiring considerable force to loosen, it is well to hold the large nut with a second wrench to prevent breaking the soldered joint between the nut and the fuel tank.

c. Cleaning the fuel line.—Disconnect the fuel line at the carburetor and also at the gasoline filter or at the fuel tank. Blow through the line to clear it.

d. Cleaning the gasoline filter.—This subparagraph is applicable to those units equipped with a gasoline filter. To clean the gasoline filter remove it from the fuel tank and blow from the end to which the fuel line is fastened until all dust and lint have been removed. Check the filter by pouring gasoline through it from the end that connects to the fuel tank. After the filter unit has been removed from the tank, it can be unscrewed from the fuel line if desired. The filter unit is composed of fine metal disks assembled very close together. It will pass gasoline but the surface tension of water is too great to permit it to pass. It therefore becomes necessary to remove the filter and drain

the fuel tank of the accumulated water at intervals depending upon the fuel, care in storage, and climatic conditions. If a gummy varnish-like substance is present in the filter or fuel line, alcohol or acetone will dissolve it.

24. Carburetor adjustment.—No attempt is made in this manual to explain the physics or principles of carburetion. A discussion may be found in TM 10-550.

a. Lauson RAY-843 engine.—The Lauson RAY-843 engine is equipped with a Tillotson No. MS74B carburetor having only one adjustment, the needle valve for fuel regulation. Adjust this valve when the engine is warmed up and under load to a point where the engine runs most smoothly. Avoid an overrich mixture.

b. Lauson RAY-885 engine.—(1) This engine is equipped with a Tillotson No. MS110A carburetor having two adjustments. The carburetor has been adjusted at the factory and no adjustment is necessary unless the settings have been disturbed. The following instructions are presented as an aid should it become necessary to adjust the carburetor:

(2) *Gasoline level.*—To set the gasoline level correctly—

(a) Remove the float cover assembly and gasket.

(b) Turn upside down with the float lever resting on the inlet needle.

(c) Bend the lever, if necessary, to give a distance of $1\frac{1}{2}$ inch from the float cover flange to the then lower edge of the float.

(3) *Adjustment.*—To adjust the carburetor after the gasoline level has been checked and adjusted as above—

(a) Close the main adjustment screw by turning in a clockwise direction, or in, to its seat. Never force the valve needle against the seat or the main nozzle will be damaged.

(b) Then open the valve (turn in a counterclockwise direction) one full turn.

(c) Loosen the idle adjustment screw locknut.

(d) Close the idle adjustment screw to its seat.

(e) Then open the idle adjustment screw one full turn.

(f) Start the engine and run at about one-third open throttle.

(g) Slowly close the main adjustment screw until the engine begins to lose speed.

(h) Then turn the screw back or open (usually $\frac{1}{8}$ to $\frac{1}{4}$ turn) to permit the engine to regain speed.

(i) The carburetor is now adjusted to the leanest mixture for maximum power.

(j) Close the throttle and allow the engine to idle at a desired engine speed, which may be controlled by the idle speed regulating screw (on the throttle stop lever).

(k) Now turn the idle adjustment screw in (close) until a noticeable missing or fluttering of the engine occurs.

(l) Slowly open the screw (approximately $\frac{1}{8}$ turn) until the engine runs evenly.

(m) Readjust the idle speed regulating screw (on throttle stop lever) to the final desired engine speed and recheck the idle adjustment screw.

(n) Tighten the idle adjustment screw locknut.

c. *Briggs and Stratton engine.*—(1) *General.*—The carburetor on this engine, like that on the Lauson engine, is a gravity type. The

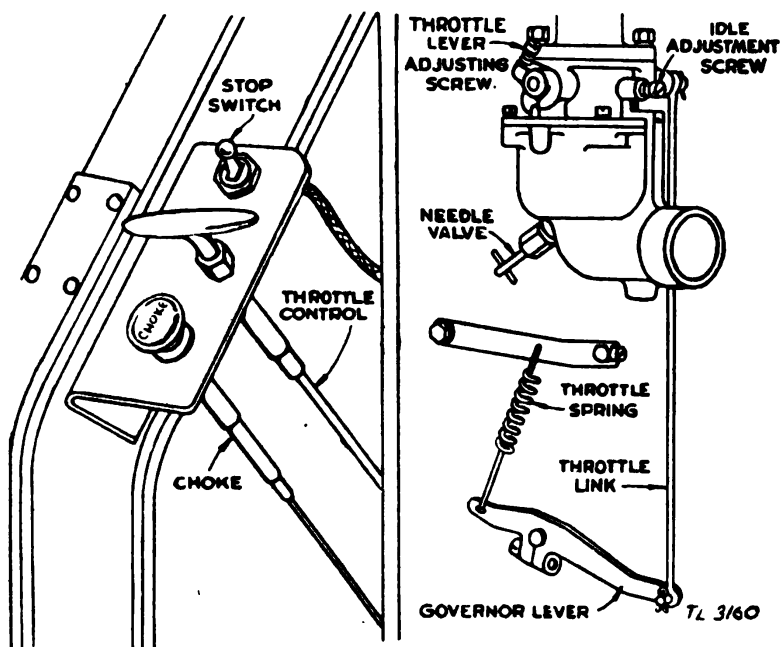


FIGURE 16.—Carburetor, governor, and manual control mechanism.

gasoline supply is regulated by a needle valve. The throttle is automatically controlled by the governor.

(2) *Removing and replacing carburetor.*—Disconnect the fuel line from the carburetor and from the fuel shut-off valve. Remove the two cap screws and lockwashers from the intake elbow. Then remove the cotter pin from the throttle shaft lever and slip the throttle link off. To replace the carburetor, reverse the operations as performed above. Use a new cotter pin if necessary. (See fig. 16.)

(3) *Cleaning carburetor.*—Remove the carburetor from the engine as explained above. Remove the fuel line connector elbow. To disassemble the carburetor proceed as follows:

(a) Remove the needle valve, stuffing box nut, packing nut gland, and nozzle.

(b) Remove the screws and lockwashers from the upper carburetor body.

(c) **Caution:** The upper and lower bodies are interlocked by the nozzle and failure to disassemble in the above order will result in damaged parts.

(d) To check the inlet valve and seat, remove the brass pin hinging the carburetor float. A worn or dirty inlet valve and seat or incorrect float level will cause the carburetor to leak. In reassembling the carburetor, the float should be in a horizontal position when it closes the inlet valve and seat.

(e) Clean any gummy parts in alcohol or acetone.

(f) Blow through all passages and openings. Do not use wire or any tools of metal to clean small openings.

(g) Replace all worn or damaged parts.

(4) *Gasoline level.*—To check the float, invert the upper carburetor body and place a scale or a flat straight piece of steel across the carbu-

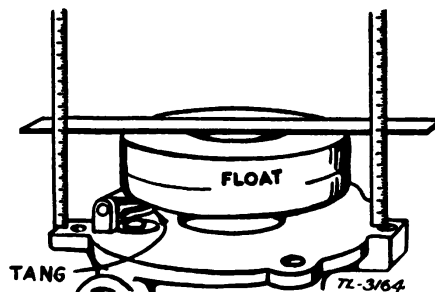


FIGURE 17.—Carburetor float position.

retor float to see that the distance from the top of the float to the carburetor body flange is equal at both sides of the float. (See fig. 17.) The float hinge tang can be bent to attain the proper position of the float.

(5) *Adjustment.*—To adjust the carburetor proceed as follows:

(a) Completely close the needle valve by turning in a clockwise direction as far as possible. Do not screw up too tightly or use force when closing the needle valve, or the needle valve and seat may be damaged.

(b) From the closed position, open the needle valve one and one-quarter turns.

(c) Close the idle adjustment screw.

- (d) Then open the idle adjustment screw one full turn.
- (e) Start and warm up the engine at about one-third throttle.
- (f) Be sure the choke is wide open.
- (g) Make the final adjustment of the needle valve to a point at which the engine runs most smoothly at full load.

(h) This setting will also take care of starting with the use of the choke. When starting a cold engine, if it is necessary to keep the choke partially closed several minutes before the engine runs smoothly, the carburetor setting is too lean and the needle valve should be opened a little by turning in a counterclockwise direction.

(i) Close the throttle and allow the engine to idle at the desired speed, which may be controlled by the throttle lever adjusting screw. It is recommended that the idle speed be 1,200 r. p. m. or more.

(j) Now turn the idle adjustment screw in (close) until a noticeable missing or fluttering of the engine occurs.

(k) Slowly open the screw (approximately $\frac{1}{8}$ turn) until the engine runs smoothly.

(l) Readjust the throttle lever adjusting screw to the final desired engine idle speed and recheck the idle adjustment screw.

25. Valve adjustment.—*a. Lauson RAY-885 engine, timing.*—With the piston coming up on the exhaust stroke, the exhaust valve should be closed when the piston reaches the top dead center. The next downward stroke is the intake or suction stroke and the intake valve should start to open after the crank has traveled 4° to 5° past top dead center, or after the piston has traveled down from the top dead center, a distance of 0.009 inch to 0.010 inch.

b. Briggs and Stratton engine.—(1) *Checking valve clearance.*—Remove the valve cover plate. The correct clearance on the exhaust valve is 0.012 inch. The intake valve should have 0.006 inch clearance on all engines. The engine should be warmed up before checking the clearance. Valve clearance is adjusted by grinding the required amount from the end of the valve stem. The end of the stem must be square with the stem proper.

(2) *Removing valves.*—Remove the cylinder head, and if the engine is not dismantled, drain the oil from the crankcase. Invert the cylinder. Compress the spring with the valve spring compressor (No. 69189-T3), and with the end of a screw driver, push out the split collars and release the spring compressor. Tilt the cylinder back far enough to allow the valve to drop, permitting its stem to clear the spring. Pry the spring out with the end of a screw driver.

(3) *Replacing valves and valve springs.*—Compress the spring in the valve spring compressor. Turn the tool to the inverted position with

collar retainer washers on top. Drop the split collars in place in the retainer washer one at a time. When the first half of the split collar is placed in the retainer washer, push it around to the back of the valve stem to permit easy placing of the second half.

(4) *Reseating valves.*—The valves are ground in the same manner as automobile valves. If the valves stick it may be that they are coated with gum or carbon. The gum can be removed with alcohol or acetone. Clean the valve stems thoroughly with a wire brush or emery cloth. Scrape all carbon from the valve posts.

(5) *Timing.*—The timing of the valves is fixed by the meshing of the camshaft gear with the gear on the crankshaft. These gears are properly meshed when the punch mark on the camshaft gear is in line with the mark on the crankshaft collar. (See fig. 18.)

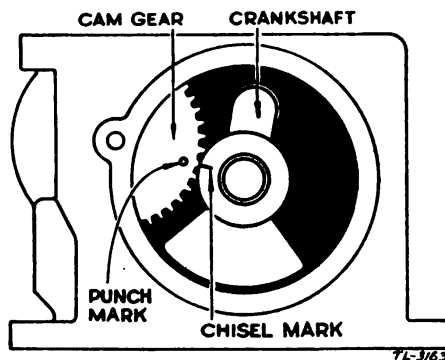


FIGURE 18.—Valve timing.

26. Governor, Briggs and Stratton engine.—*a. Adjusting speed.*—The speed of the engine is adjusted at the control panel. To increase the engine speed, turn the throttle counterclockwise and pull out until the motor runs at the desired speed. To decrease the motor speed push down on the throttle control. When the speed has been adjusted to the desired value, turn the control clockwise to lock it in position. The normal operating speed is 3,600 r. p. m.

b. Resetting governor lever.—If the governor lever has been loosened or removed from the governor shaft, it may be reset easily by proceeding as follows:

(1) With the carburetor attached to the motor and hooked up to the governor lever with the throttle link, loosen the screw holding the governor lever on the shaft.

(2) Push the governor lever toward the left as far as it will go.

(3) Hold it in this position and turn the governor shaft clockwise with pliers until it strikes a stop in the crankcase.

(4) Tighten the screw binding the governor lever to the shaft until the lever is snug.

(5) Push the governor lever to the right as far as it will go and tighten the screw securely.

27. Flywheel, Briggs and Stratton engine.—a. Removing.—

The flywheel is securely attached to the crankshaft by means of a taper fit, a soft flywheel key, lockwasher, and a right-hand thread nut. Remove the blower housing. Place a block of wood under a flywheel fin on the left side of the flywheel to hold it rigid and prevent its turning. (See fig. 19.) Place a $\frac{15}{16}$ -inch socket wrench on the nut. Apply force to the wrench in a counterclockwise direction and tap it with a hammer to loosen. Great care is necessary in this operation to prevent breaking a fin from the flywheel which would cause unbalance and render it useless. After the pulley is removed, remove the two screws and washers from the flywheel. Then the flywheel can be removed with the aid of the flywheel puller, No. 29157, provided with the motor.

b. Replacing.—Place the flywheel on the crankshaft with the key in place. Reverse the operations given in *a* above. Draw the nut up *very tight* by tapping the bar or wrench with a hammer. Be sure the flywheel key is a soft key. If a hard key is used and the flywheel becomes loose, the crankshaft and flywheel key seat will be damaged probably to an extent requiring replacement.

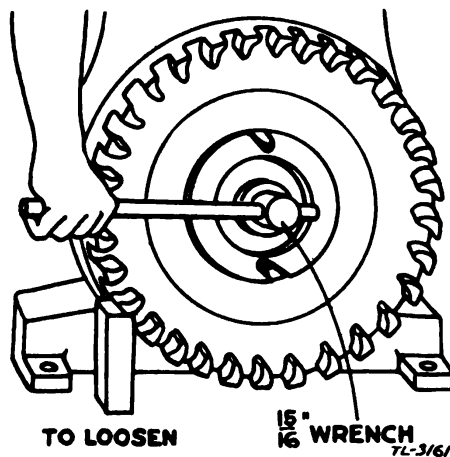


FIGURE 19.—Removing the flywheel.

28. Ignition systems.—a. General care and maintenance.—The information in this paragraph is necessarily limited to the ignition systems of the particular engines which are a part of the reel units RL-26 and RL-26-A. No attempt is made to explain the theory of ignition electricity. TM 10-580 contains information and theory

on the capacitor, high-voltage ignition, spark plugs, ignition timing, high-voltage magneto, interrupters, inductor-type magneto, and magneto timing which are generally applicable to the engines used on the RL-26 and RL-26-A. There are several common causes of failure of the ignition system. Fortunately, most of these causes of failure become evident upon examination or inspection. Some of them are listed below.

(1) The high-voltage cable may be short-circuited. Examine it for deterioration or damage by oil, age, wear, or misuse.

(2) The wire to the ignition switch may be short-circuited. Examine it carefully, especially where it connects to the switch screw.

(3) The spark plug may be fouled. Remove and examine it, paying particular attention to both the points and the porcelain.

(4) If the trouble cannot be traced to the above causes it will be necessary to inspect the magneto. This involves removing the blower housing and the flywheel.

(5) Examine the breaker points. If they are worn or pitted, dress with a carborundum stone especially designed for this purpose. Then remove all dust particles with a dry cloth. Do not use a steel file on contact point surfaces. Stiff paper or cardboard will remove the oxide formation on the contact points resulting from long idleness.

b. Wico magneto on the Lauson RAY-843 engines.—The information in this subparagraph is applicable only to those engines which are equipped with the Wico magneto.

(1) *Adjusting breaker points* (fig. 20).—Turn the rotor assembly *R* to bring the highest point of the cam *C* in contact with the breaker lever causing the breaker points *B* to open to the maximum distance. Loosen the adjusting screw *S* on the breaker lever, insert a feeler gage or a strip of metal 0.010 inch thick between the breaker points, and tighten adjusting screws. The maximum distance the breaker points open should now be equal to the thickness of the gage or 0.010 inch. The engine will not operate properly if the maximum opening of the breaker points is not within 0.007 to 0.010 inch inclusive.

(2) *Magneto timing.*—Turn the rotor assembly *R* in a clockwise direction until the cam just starts to open the breaker points. Take note of the gap at *G*. The corner of the rotor notch should have traveled away from the pole shoe in the coil a distance of $\frac{5}{16}$ inch. If this gap distance is greater than $\frac{5}{16}$ inch, loosen the cam adjusting nut *N* and shift the cam on its axis until this gap is $\frac{5}{16}$ inch at the moment the breaker points just open. Tighten the adjusting nut *N*. Replace flywheel, being careful that the key in the crankshaft engages properly in the keyseat of the flywheel. Replace the blower housing.

If, after the above check-up and adjustments are completed the magneto still fails to function, it will be necessary to send it to a depot repair shop.

c. *Eisemann magneto.*—The information contained in this paragraph is applicable to the Eisemann magneto with which the Lauson RAY-885 engines are equipped.

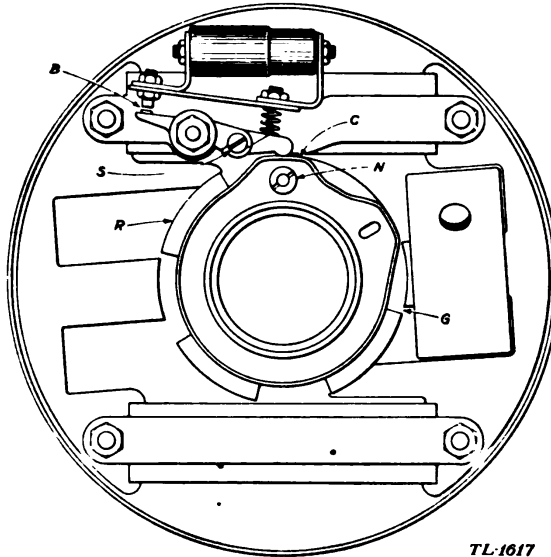


FIGURE 20.—Breaker contact adjustment, Wico magneto.

(1) *Checking breaker points.*—This magneto functions at its maximum efficiency with a maximum breaker point opening of 0.018 inch to 0.022 inch, inclusive. To check the gap proceed as follows:

- (a) Remove the flywheel from the crankshaft.
- (b) Remove the spark plug.
- (c) Rotate the crankshaft slowly in a clockwise direction until the breaker lever fiber rests on the highest part of the cam approximately $\frac{1}{8}$ inch past the breaking edge or 30° beyond the firing point.
- (d) Check the gap between the breaker points with a 0.020 inch feeler gage.

(e) Although the breaker points remain open during the entire travel of the cam from the breaking edge to the closing edge, being closed only while the flat section of the cam is passing the breaker lever fiber, the cam must be positioned as illustrated when gaging the breaker gap. The heavy section of the cam is slightly eccentric, and the breaker points are not fully separated when the closing edge of the cam approaches the breaker lever fiber. (See fig. 21.)

(2) *Adjusting gap.*—If it is necessary to adjust the gap proceed as follows:

- (a) Loosen slightly the screw which fastens the breaker plate to the stator plate and leave it friction tight.
- (b) Remove the entire breaker mechanism toward the cam to increase the gap, or away from the cam to decrease the gap.
- (c) Tighten the breaker plate fastening screw securely.
- (d) Do not loosen the locknut on the stationary breaker screw.
- (e) The entire breaker assembly pivots on the breaker lever bearing pin, which permits adjustment of the gap without altering the relationship between the breaker point surfaces.

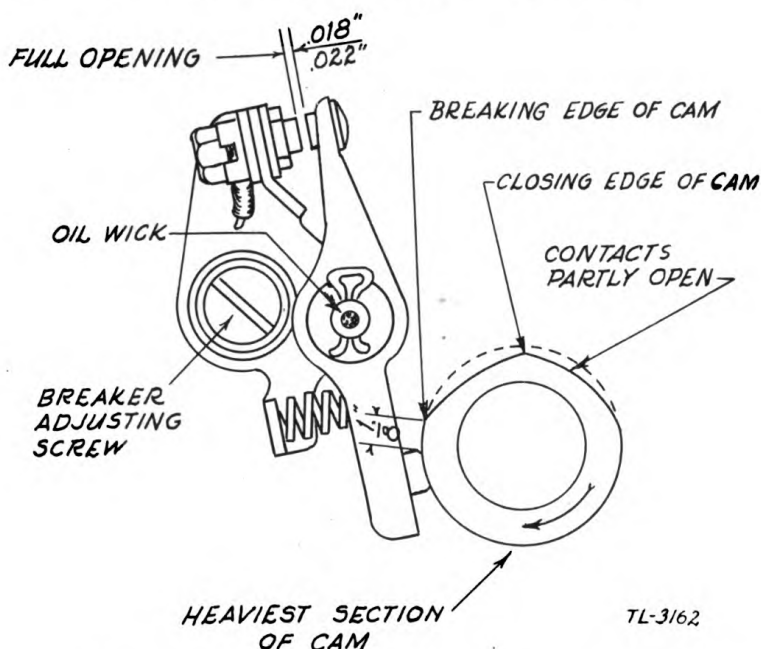


FIGURE 21.—Breaker contact adjustment, Eisemann magneto.

(3) *Setting timing of magneto.*—The synchronism of the breaker point interruption and the pole shoe gap is illustrated in figure 22. At the instant of the spark, which occurs when the breaker points first separate, the edge of the leading pole shoe should be from $\frac{3}{32}$ inch to $\frac{3}{16}$ inch away from the center leg of the winding core in the direction of rotation, with the edge of the trailing pole shoe centered over the winding. It is vitally important to maintain the correct pole shoe gap, and this can be accomplished only by maintaining the breaker point opening within the specified limits of 0.018 inch to 0.022 inch inclusive. If the breaker point opening is adjusted to less than 0.018 inch the effect is to increase the pole shoe gap, and if the breaker point

opening is adjusted to more than 0.022 inch a reduction in pole shoe gap results. This consequently impairs the performance of the magneto and is manifested by an engine hard to start.

(4) *Ignition cable*.—Install the eyelet terminal at the spark plug end. Strip the insulation from the other end sufficiently to expose $\frac{1}{16}$ inch of wire. Twist the ends together and attach to the coil winding. It is unnecessary to solder the cable to the coil winding.

(5) *Replacing cam*.—Should the breaker cam be removed from the crankshaft, it should be replaced with the arrow (indicating rotation) on the outside.

(6) *Lubrication of magneto*.—The magneto should require no lubrication for long periods of service. Frequent removal of the flywheel

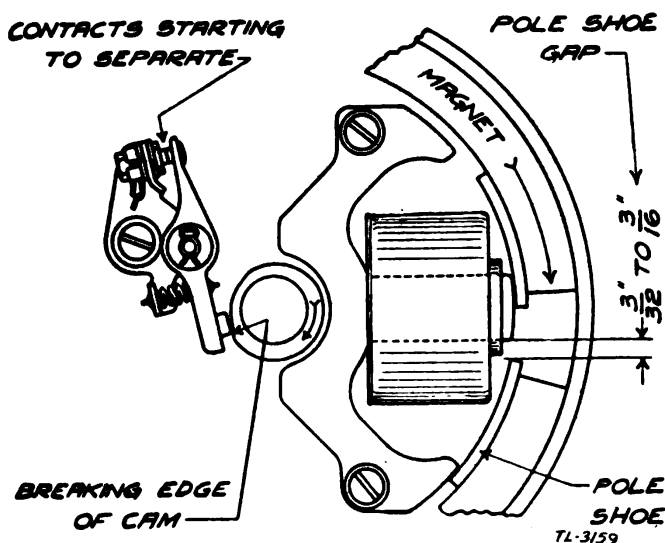


FIGURE 22.—Contact point interruption and pole shoe gap synchronism.

for this purpose alone is not recommended. If, however, it does become necessary to remove the flywheel, apply one drop of crankcase oil to the concealed oil wick in the breaker lever bearing pin and spread a light covering of vaseline or grease over the breaker cam operating surface.

d. Briggs and Stratton ignition system.—(1) *General*.—The spark is produced by a high-voltage magneto consisting of an armature, capacitor, contact points, and rotating magnets. The magnets are cast in the flywheel. It is a simple, reliable, self-contained system which does not involve the use of batteries. The ignition current is conducted into the cylinder by the ignition cable and the spark plug. The magneto, cable, and spark plug must all be in proper condition and adjustment to insure a good hot spark.

(2) *Checking spark*.—Remove the ignition cable from the spark plug and hold the metal terminal about $\frac{1}{8}$ inch from any metal part of the cylinder head, keeping the hand on the insulated part of the cable to avoid shock. Turn the engine with the starter. If the spark jumps this gap, the ignition system is in good operating order.

(3) *Spark plug adjustment*.—Spark plugs should be cleaned and the points reset to 0.025 inch after each 100 hours of operation. The points burn away in service. They may be cleaned by washing off the carbon with gasoline or kitchen scouring powder. The points should be scraped or sandpapered. Inspect the plug for cracks in the porcelain. A spark plug may fail because of a cracked porcelain, dirt or carbon on the porcelain, or a wet outside. It is advisable to keep a new spark plug with every engine as a spare. Champion No. 6M, Auto Lite No. B5, or their exact equivalents are recommended. When replacing the spark plug in the cylinder head, put a little graphite grease on the threads. Do not get grease on the points. Information on the operation and construction of spark plugs is given in TM 10-580.

(4) *Ignition cable*.—See paragraph 28a(1) for troubles in the cable. On the Briggs and Stratton engines the cable should be soldered to the secondary terminal loop (small brass plate extending from the coil). Avoid touching the coil with a hot soldering copper.

(5) *Magneto assembly*.—(a) *Removing*.—After removing the flywheel (par. 27a), detach the ignition cable from the spark plug and remove the back plate, flywheel key, contact point dust cover, and the four magneto mounting screws. Turn the crankshaft so the contact plunger holds the contact points open and then remove the magneto assembly.

(b) *Replacing*.—To replace the magneto, reverse the operations above and use the old gasket between the plate and crankcase, or, if damaged, a new gasket. It is necessary that the new gasket be of the proper thickness to give the correct end play (0.002 inch to 0.008 inch) between the magneto bearing and the crankshaft thrust faces as shown in figure 23. Use lockwashers under the mounting screws.

(6) *Magneto timing*.—The magneto is always correctly timed with the engine when the flywheel is assembled to the tapered crankshaft with a key and securely held in place with a right-hand thread nut. Do not attempt to change the timing by relocating any parts or filing the camshaft timing flat.

(7) *Adjusting contact points* (fig. 24).—While the magneto plate is on the motor crankcase, turn the crankshaft by hand and check the contact points for proper opening and closing action. The contact

points must be clean and must line up squarely to make good electrical contact. Do not file contact points. Fine sandpaper or a fine grit hone may be used to clean the points. If the contact points are out of line proceed as follows to line them up:

(a) Loosen the contact spring bolt.

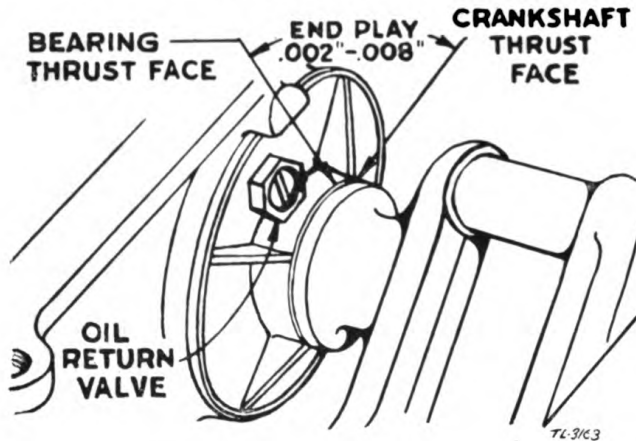


FIGURE 23.—Correct end play.

(b) Move contact spring assembly to line up with contact screw point.

(c) Tighten contact spring bolt.

(8) *To adjust contact spring tension.*—(a) Turn the crankshaft until the points are in the open position.

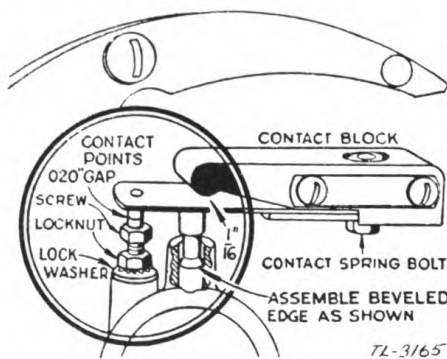


FIGURE 24.—Magneto contact points.

(b) Place a $\frac{1}{16}$ -inch gage between the contact spring and the round end of the contact block.

(c) Tighten the contact block screws.

(d) Turn contact screw to secure 0.020 inch gap.

(e) Tighten the contact screw locknut against the lockwasher.

(f) If *either* or *both* points are badly pitted or burned, replace *both* points, parts No. 63238 and No. 69754.

(g) See figure 24 for details.

(9) *Replacing capacitor.*—A leaky capacitor may cause the engine to be hard to start, to sputter, or to misfire under load. If the motor misfires after the gasoline line, carburetor, spark plug, cable, and contact points have been checked, install a new capacitor. Slip the short insulator sleeve over the capacitor wire. Solder the end of the capacitor wire and the primary wire to the contact spring. (See fig. 25.)

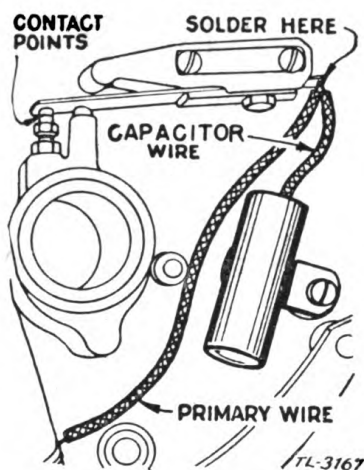


FIGURE 25.—Capacitor installation.

If, after installing a new capacitor, the ignition system still fails to deliver a satisfactory spark, it is recommended that the engine be sent to the depot repair shop for repair. Additional information on the operation of the capacitor is given in TM 10-580.

(10) *Armature.*—(a) *Removing.*—Remove the armature lead wire from the contact spring, and the high-voltage ignition cable from the secondary terminal loop in the armature. Both wires are soldered. Save as much of the hydrolene as possible so that the high-voltage terminal can be insulated when assembling the new armature. Do not use battery compound or tar as it will melt and run over the entire magneto assembly. Unscrew the two armature mounting screws and pry the armature loose with a screw driver.

(b) *Replacing.*—To install the armature place the dust cover clip under the upper mounting screw and tighten the lower mounting screw. Then solder the ignition cable to the terminal and fill the pocket, formed with the flap, with hydrolene. Solder the armature lead wire to the contact spring. Replace the dust cover and the clip

holding the cover in place. Tighten the upper armature mounting screw. (See fig. 26.)

An air gap of 0.002 inch to 0.010 inch must be maintained between the armature shoes and the flywheel poles. The gap must be sufficient to prevent rubbing, but it must not exceed 0.010 inch or poor ignition may be expected. To check the armature shoes for rub when replac-

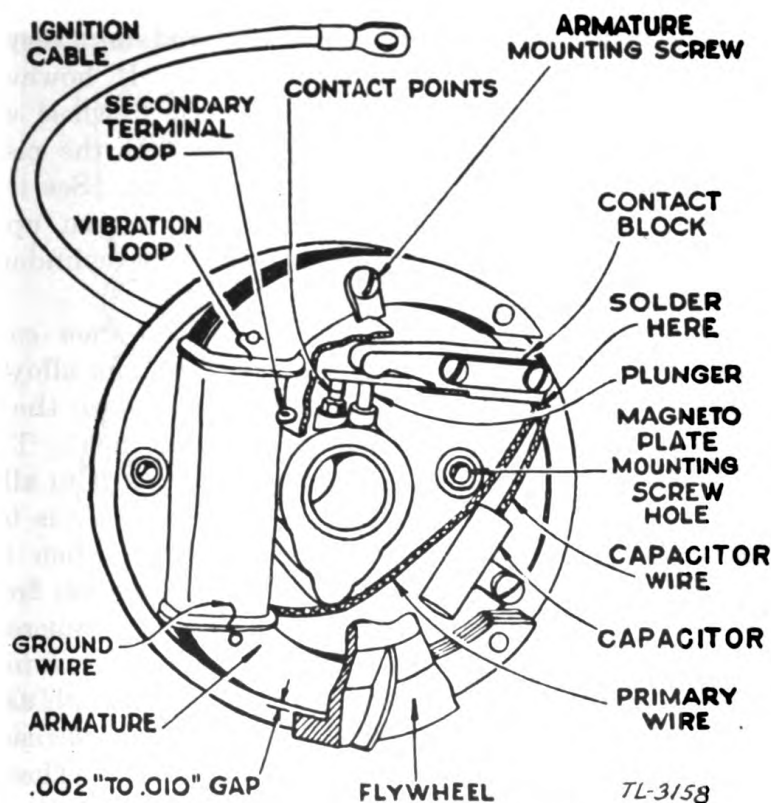


FIGURE 26.—Complete magneto assembly.

ing the armature, chalk the edges and replace the flywheel. Remove the spark plug to relieve compression and turn the flywheel several revolutions by hand. Remove the flywheel and examine the edges of the armature shoes. The chalk will be rubbed off the high spots. File the high spots carefully with a fine file until the flywheel clears, but do not remove too much metal.

29. Cylinder head, Briggs and Stratton engine.—The cylinder head is held on with six studs and nuts. Care should be exercised in replacing it, following its removal for carbon cleaning or valve grinding. Use a new gasket if possible. Otherwise, clean the old gasket and coat both sides with cup grease. Do not use shellac on cylinder head gaskets. Tighten each nut a little at a time after they come in

contact with the cylinder head so that the head is pulled down evenly and each stud is taking its portion of the strain.

30. Compression.—Proper compression is obtained when the valves seat properly, the gaskets do not leak, and the piston and rings are properly fitted. When tuning up a motor, it is always well to check the compression. This may be done by turning the motor over quickly by hand. If turned slowly sticky valves may not be detected. If a noticeable point of resistance is encountered on every other revolution, the compression should be satisfactory. If, however, the engine turns over two complete revolutions of the flywheel without developing compression resistance, it is possible that the piston or piston rings are worn or that the valves or gaskets leak. See that the spark plug has a gasket under it, and that it is drawn up tight. Check the cylinder head gasket and tighten the cylinder head nuts when the engine is hot.

31. Piston assembly.—*a. Piston, Briggs and Stratton engine.*—The piston in this engine is made of a special aluminum alloy which is very light in weight. The standard clearance between the piston skirt and the cylinder wall is 0.0055 inch to 0.007 inch. The top and second lands of the piston are smaller than the skirt to allow for the greater expansion at the piston head. This clearance is to compensate for the considerable expansion of aluminum when heated. When the piston is removed, thoroughly clean the carbon from the head of the piston and the ring grooves. If the piston is not round or if it is scored it should be replaced. When fitting a new piston in the engine, assemble it with the free side pinhole (marked with an X on the boss) toward the magneto side. If an oversize piston is necessary it is recommended that the cylinder be rebored. The engine should be returned to the depot for this purpose.

b. Piston rings.—The piston rings when fitted in the cylinder should have a gap of 0.0007 inch to 0.017 inch. The rings should be fitted in the cylinder below the piston ring travel. Before assembling new rings to the piston, thoroughly clean the piston ring grooves. After the rings are assembled to the piston determine that the rings move in the grooves freely.

32. Piston pin, Briggs and Stratton engine.—The piston pin is a free fit in one side of the piston and a tight fit in the other side. To remove this pin without special equipment it is advisable to heat the piston in boiling water to expand the aluminum alloy. Cut a wooden pin, smaller than the size of the piston pin, and use this and a hammer to drive the pin out while the piston is still hot. Drive the pin out through the free fit hole. This hole is toward the magneto

side and is marked with an X on the pinhole boss. The pin is easily replaced if the piston is heated as described above.

33. Connecting rod, Briggs and Stratton engine.—The connecting rod is also made of a special aluminum alloy combining strength with light weight. The assembly marks at the lower bearing must be toward the magneto side, when the connecting rod is assembled to the crankshaft. This engine has a connecting rod with a locking plate as shown in figure 27. The tang of this plate fits into the slot provided

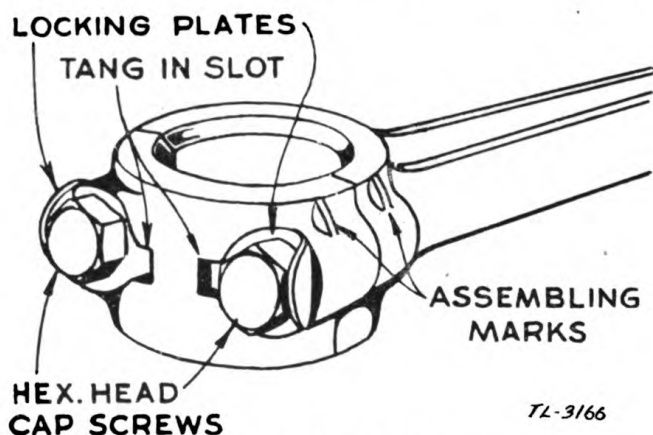


FIGURE 27.—Connecting rod assembly.

for it and the plate is bent against the hexagon head of the cap screw. The assembly marks on the bearing cap and on the rod must be on the same side.

34. Oil pump, Briggs and Stratton engine.—The oil pump is assembled to the crankcase, being supported by two bolts and lockwashers. An eccentric on the cam gear operates it. An inoperative pump will cause insufficient lubrication and the cylinder and piston may be scored. The oil pump may be checked by removing the base and the two bolts that hold the pump in place. Then place the pump in a pan with oil about $\frac{1}{2}$ inch deep and move the plunger up and down. If the pump is in good operating condition, a stream of oil will be forced out of the hole in the plunger. If the pump does not function it may be clogged, in which case, remove the plunger and plunger spring and submerge the parts in kerosene or gasoline 3 or 4 hours to loosen the accumulated sludge or gum. If the pump fails to function after reassembly, it should be replaced. When assembling the pump be sure the spring and plunger are in place as shown in figure 28.

35. Oil leaks, Briggs and Stratton engine.—To correct oil leaks from the external end of either crankshaft bearing, remove

the base from the engine. Remove the oil return valve and clean or flush with gasoline. (The oil return valve is screwed into the magneto backplate below the main bearings.) Blow out any dirt lodged under the small disk. Replace the oil return valve with new parts if necessary. (See fig. 28.)

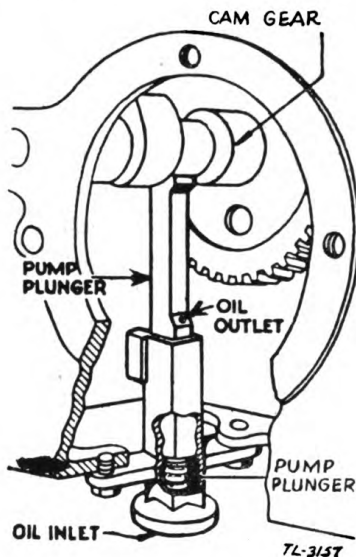


FIGURE 28.—Oil pump.

36. Excessive carbon.—This is caused by using the improper grade of oil, too much oil getting into the combustion chamber (usually the result of the piston rings not seating properly or sticking), carburetor set too rich, or long service. The outward manifestation of an unusual amount of carbon is a noticeable knocking of the engine (carbon knock) or a loss of power. The carbon should be removed from the valves, valve parts, piston head, piston rings and ring grooves, cylinder head, and the top of the cylinder bore.

37. Air cleaner.—The air cleaner protects the engine from dust and dirt that otherwise would be drawn into the combustion chamber through the carburetor intake. Clean the air cleaner occasionally, removing and washing it in kerosene. Ascertain that it is not clogged by blowing through it or by noting if the motor performs better with it off. If it is clogged it should be replaced. Keep the oil level up to the beading. Read and follow the instructions on the air cleaner label.

38. Muffler.—It is possible, after long periods of service, that the muffler may become clogged to a point where it will reduce the power of the engine. To check the muffler, remove it from the engine and run water into the open end of the muffler. If full streams of water

come out of the small holes at the end of the muffler, it certainly is not clogged up. If, however, the water runs through very slowly, the muffler is probably clogged up and should be replaced.

39. Overload.—Overloading will cause the engine to overheat and lose power, or may even cause it to stop. Holding the loop too tight or pulling a wire line that is too long or that has too much drag due to underbrush, sand, mud, etc., are the most common causes of overload. Damaged or poorly lubricated reel units or damaged reels DR-5 contribute to the load.

40. Storing.—Before placing units in storage for a considerable period, the crankcase, fuel tank, carburetor, and transmission housing should be drained. If the units are RL-26-A the covers BG-68 should be placed over them and lashed down tightly. Crating depends upon the storage space and the shipping required. Generally for overnight storage or other short period storage much trouble from gum and water in the fuel can be avoided by completely filling the fuel tank before the engine is put in storage. This prevents evaporation of the gasoline, which causes gum, or condensation of moisture in the tank, which causes water.

41. Engine trouble chart.—*a. Engine hard to start.*

- (1) No gasoline in tank.
- (2) Gasoline flow obstructed.
- (3) Water in fuel supply.
- (4) Loose or defective wiring.
- (5) Spark plug cracked.
- (6) Spark plug fouled
- (7) Improper gas mixture.
- (8) Throttle valve stuck.
- (9) Throttle rod loose or out of adjustment.
- (10) Intake manifold leaking.
- (11) Valve seats bad.
- (12) Valve sticking.
- (13) Improper timing.
- (14) Defective magneto—
 - (a) Breaker points worn or pitted.
 - (b) Breaker points out of adjustment.
 - (c) Breaker cam out of time.
 - (d) Switch wire short-circuited.
 - (e) High tension wire short-circuited.

b. Engine missing.

- (1) Spark plug fouled.
- (2) Spark plug cracked.

- (3) Spark plug gap wrong (correct gap 0.025 inch).
- (4) Defective wiring.
- (5) Ignition breaker points sticking.
- (6) Cylinder head gasket leaking.
- (7) Manifold gasket leaking.
- (8) Valves warped or broken.
- (9) Valves or tappets sticking.
- (10) Valve tappets improperly adjusted (correct clearance 0.008 inch to 0.010 inch when hot).

c. Engine overheating.

- (1) Spark retarded too far.
- (2) Carburetor choke valve partly closed.
- (3) Improper gas mixture.
- (4) Improper timing.
- (5) Valves leaking.
- (6) Oil badly diluted.
- (7) Lack of oil.

d. Engine lacks power.

- (1) Valve seats worn.
- (2) Piston rings weak or worn.
- (3) Piston rings sticking.
- (4) Improper gas mixture.
- (5) Improper timing.
- (6) Muffler clogged.
- (7) Governor or throttle loose.
- (8) Oil badly diluted.
- (9) Air cleaner needs cleaning.

e. Engine knocks.

- (1) Carbon in cylinder.
- (2) Loose main bearing.
- (3) Loose rod bearing.
- (4) Worn piston and cylinder.
- (5) Loose valve tappets.
- (6) Motor overheated.
- (7) Tight piston.
- (8) Loose flywheel.
- (9) Lack of oil.

f. Faulty carburetion.

- (1) Carburetor improperly adjusted.
- (2) Valve leaking.
- (3) Intake manifold leaking.
- (4) Gaskets leaking.

(5) Shut off valve closed.

(6) Using too much fuel.

(7) Water in fuel.

(8) Sediment in fuel tank.

g. Excessive smoke from exhaust.

(1) Too much oil in crankcase.

(2) Carburetor needle valve open too far.

(3) Carburetor float sticking or leaking.

(4) Lubricating oil too thin to seal piston.

(5) Worn bearings.

h. Explosion in muffler.

(1) Ignition too late.

(2) Weak spark.

(3) Exhaust valve holding open.

(4) Exhaust valve warped.

i. Explosion in carburetor or intake manifold.

(1) Gas mixture too lean.

(2) Intake valve sticking.

(3) Intake tappet sticking.

(4) Intake valve spring weak.

(5) Intake manifold leaking.

(6) Intake valve warped or broken.

(7) Intake tappet set too close.

(8) Incorrect timing.

(9) Cylinder head gasket leaking.

j. Poor compression.

(1) Valves not seating.

(2) Valves sticking.

(3) Valve tappet sticking.

(4) Valve tappets set too close.

(5) Piston rings worn or weak.

(6) Piston rings broken.

(7) Piston rings sticking.

(8) Loose spark plug.

(9) Cylinder head loose.

(10) Cylinder head gasket leaking.

(11) Oil too thin to seal piston.

(12) Scored cylinder.

(13) Worn piston and cylinder.

(14) Cracked spark plug.

SECTION V

SUPPLEMENTAL DATA AND LIST OF
REPLACEMENT PARTS

	Paragraph
General.....	42
List of replacement parts of reel units RL-26 and RL-26-A (less engine parts).....	43
List of replacement parts of Lauson RAY-843 engine.....	44
List of replacement parts of Lauson RAY-885 engine.....	45
List of replacement parts of Briggs and Stratton, model A, Nos. 208,072 and 208,097 engines.....	46

42. General.—*a. Reel units RL-26 and RL-26-A.*—When ordering parts for the reel units (not including the engine or engine parts), include a complete copy of the name plate data. These data will consist of—

- (1) Type of unit.
- (2) Manufacturer.
- (3) Serial number.
- (4) Order number.

The order should specify the part by name and by Signal Corps catalog stock number if the part has been assigned a stock number, or by name and Signal Corps drawing number if it has not been assigned such a stock number. The applicable Signal Corps drawing number can be obtained from the list of replacement parts (par. 43) by referring to the part by name and the column whose order number corresponds to the order number on the name plate of the reel unit for which the part is intended.

b. Engine parts.—When ordering engine parts or replacement engines, a complete copy of the name plate data on the engine should accompany the order. These data will consist of—

- (1) Manufacturer.
- (2) Model number or letters.
- (3) Type number or letters.
- (4) Serial number.

The order should specify the part by name and manufacturer's number if the part has not been assigned a stock number in the Signal Corps general catalog. These numbers may be obtained from the engine lists of replacement parts, paragraphs 44 to 46, inclusive. Do not use the numbers sometimes found on the engine castings. Repairs should be made with authorized parts. Substitute parts or makeshift arrangements are not recommended except in emergencies.

43. List of replacement parts of reel units RL-26 and RL-26-A (less engine parts).—*a. General.*—This list of replacement

parts is complete for all of the reel units RL-26 and RL-26-A built on the several orders and under the several Signal Corps specifications up to March 15, 1941. The list of replacement parts is made up in the form of a chart and consists of seven columns, A to G, inclusive, and is explained as follows:

Column A is a list of the numbers of the lines.

Column B is a list of the quantity of each part required for one reel unit.

Column C is a list of the names of the parts.

Column D is a list of the Signal Corps drawings and detail numbers of parts of the units built on order No. 7244—Chi. Sixty units, all equipped originally with the Lauson RAY-843 engine, were built by the Leach Company, Oshkosh, Wis., on this order under Signal Corps laboratory specification No. 71-666.

Column E is a list of the Signal Corps drawings and detail numbers of parts of the units built on order No. 8233—Chi. Sixty units, all equipped originally with the Lauson RAY-843 engine, were built by the Leach Company on this order under Signal Corps laboratory specification No. 71-666-A.

Column F is a list of the Signal Corps drawings and detail numbers of the parts of the units built on order No. 9787—Chi.-39. Six hundred units, all originally equipped with the Lauson RAY-885 engine, were built by the Leach Company on this order under Signal Corps laboratory specification No. 71-666-C.

Column G is a list of the Signal Corps drawings and detail numbers of the parts of the units built on the following order numbers:

No. 1378—Chi.-40—Leach Company built 1,213 units, all equipped with Briggs and Stratton Model A, 208,072 engines.

No. 206—Chi.-41—Gar Wood Industries, Inc., Detroit, Mich., built 494 units.

No. 599—Chi.-41—Gar Wood Industries, Inc., built 2,354 units.

No. 204—Chi.-41—Leach Company built 400 units.

No. 693—Chi.-41—Leach Company built 500 units. Signal Corps laboratory specifications No. 71-666-D were used in building all of the units on the orders listed in column G. The parts, therefore, are interchangeable regardless of the manufacturer. Since two different engines, built by two manufacturers, are used on the units on the orders listed in column G, the engine parts are not interchangeable between manufacturers' types; but the entire engines are interchangeable within the reel units, regardless of the make of the reel unit or the engine. The units built on the 1941 orders listed in

column G are equipped with one of the two recent model engines considered in this manual.

b. While all the parts are included in the list of replacement parts, it generally will be advantageous for using organizations to replace damaged or worn parts by replacing the complete assembly of which the damaged or worn piece is a part. Under each separate heading the complete assembly is shown in italics with a list of its parts following below.

REEL UNITS RL-26 AND RL-26-A

TM 11-360
43

A Line No.	B Num- ber re- quired for each unit	C Item	D Units built on order No. 7224-Chi.		E Units built on order No. 8233-Chi.		F Units built on order No. 9787-Chi.-39		G Units built on orders No. 1378-Chi.-40 No. 206-Chi.-41 No. 599-Chi.-41 No. 204-Chi.-41 No. 693-Chi.-41	
			Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.
1		CHAIN								
2	1	Chain, No. 60W, 76 links	SC-D-1624-B	8	SC-D-1624-C	8	SC-D-1624-E	8	SC-D-1624-E	8
3	1	Connecting link	1624-B	8	1624-B	8	1624-E	8	1624-E	8
4		CHAIN GUARD								
5	1	*Bracket	SC-D-1648-A	2	SC-D-1648-B	2	SC-D-1648-C	2	SC-D-1648-C	2
6	1	*Bracket	1648-A	3	1648-B	3	1648-C	3	1648-C	3
7	1	*Bracket	1648-A	4	1648-B	4	1648-C	4	1648-C	4
8	1	*Bracket	1648-A	5	1648-B	5	1648-C	5	1648-C	5
9	1	Filler	1648-A	6	1648-B	6	1648-C	6	1648-C	6
10	1	Filler	1648-A	7	1648-B	7	1648-C	7	1648-C	7
11	1	*Guard	1648-A	1	1648-B	1	1648-C	1	1648-C	1
12	1	Guard assembly	1647-A	1-12	1647-A	1-12	1647-B	1-12	1647-B	1-12
13	8	Nut, square, std., 1/4"-20	1647-A	12	1647-A	12	1647-B	12	1647-B	12
14	11	*Rivet, 3/16" x 7/8" long	1647-A	8	1647-A	8	1647-B	8	1647-B	8
15	4	Screw, rd. hd. m., 1/4"-20 x 7/8" long	1647-A	10	1647-A	10	1647-B	10	1647-B	10
16	8	Washer, lock, std., 1/4"	1647-A	11	1647-A	11	1647-B	11	1647-B	11
17		CONTROL PANEL								
18	1	Choke control	SC-D-1653-A	2	SC-D-1653-B	2	SC-D-1653-C	2	SC-D-1653-C	2
19	1	Control panel assembly	1653-A	1-7	1653-B	1-7	1653-C	1-7	1653-C	1-7
20	3	Nut, hex., std., 10-32	1653-A	6	1653-B	6	1653-C	6	1653-C	6

*These articles are a part of an assembled unit and should not be ordered separately.

SIGNAL CORPS

A	B	C	D		E		F		G
Line No.	Num-ber re-quired for each unit	Item	Units built on order No. 7224-Chi.		Units built on order No. 8233-Chi.		Units built on order No. 9787-Chi. 39		Units built on orders No. 1378-Chi.-40 No. 206-Chi.-41 No. 599-Chi.-41 No. 204-Chi.-41 No. 683-Chi.-41
			Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	
CONTROL PANEL—Continued									
21	1	Panel.....	1653-A	1	1653-B	1	1653-C	1	1653-C
22	1	Plate.....	1653-A	4	1653-B	4	1653-C	4	1653-C
23	3	Screw, rd. hd. m., 10-32 x 3/4" long	1653-A	5	1653-B	5	1653-C	5	1653-C
24	1	Switch, SW-105, S. P. S. T.	SC-A-1042-K	1	SC-A-1042-K	1	SC-A-1042-K	1	SC-A-1042-K
25	1	Throttle control.....	SC-D-1653-A	3	SC-D-1653-B	3	SC-D-1653-C	3	SC-D-1653-C
26	3	Washers, lock, std., No. 10	1653-A	7	1653-B	7	1653-C	7	1653-C
COUPLING									
28	2	Bolts, SAE, 5/16"-24 x 1/2" long	SC-D-1649-B	9	SC-D-1649-B	9	SC-D-1649-C	9	SC-D-1649-D
29	1	Connecting hub.....	1650-B	1	1650-C	1	1650-D	1	1650-F
30	1	Connecting hub.....	SC-D-1650-B	2	SC-D-1650-C	2	SC-D-1650-D	2	SC-D-1650-F
31	1	Coupling complete.....	1649-B	1-13	1649-B	1-13	1649-C	1-13	1649-D
32	2	Disc, coupling.....	1650-B	4	1650-C	4	1650-D	4	1650-F
33	2	Driving hub.....	1650-B	3	1650-C	3	1650-D	3	1650-F
34	2	Dowel.....	1650-B	7	1650-C	7	1650-D	7	1650-F
35	2	Key.....	1650-B	8	1650-C	8	1650-D	8	1650-F
36	4	Nut, hex., std., 1/4"-28	1649-B	13	1649-B	13	1649-C	13	1649-D
37	2	Screw, set, headless, cup point, 5/16"-18x3/4" long	1649-B	12	1649-B	12	1649-C	12	1649-D
38	4	Screw, 1/4"-28x-15/16" long	1650-B	5	1650-C	5	1650-D	5	1650-F
39	4	Screw, 0.250"-28x3/4" long	1650-B	6	1650-C	6	1650-D	6	1650-F
40	2	Washer, split spring, SAE, reg. for 5/16" bolt	1649-B	11	1649-B	11	1649-C	11	1649-D
41	24	Washer, std. cut for 1/4" bolt	1649-B	10	1649-B	10	1649-C	10	1649-D

COVER BG-68									
42	1	Cover BG-68 assembly						SC-D-2960-A	1-7
43	1	*End piece						SC-D-2960-C	1-7
44	1	*End piece						2961-B	1
45	1	*End piece						2961-C	2
46	23	Grommet, Edwin B. Stimpson Co., No. 5						2960-A	5
47	1	Rope, draw, 1/4"x76" long						2960-C	6
48	4	Rope, tie, 1/4"x33" long						2960-A	7
49	As req.	*Thread, linen						2960-C	4
50	1	*Top piece						2962-B	3
CRANK									
51	1	Arm	SC-D-1380-D	1	SC-D-1380-F	1	SC-D-1380-H	SC-D-1380-H	1
52	1	Button	1380-D	5	1380-F	5	1380-H	1380-H	5
53	1	Crank GC-4 and GC-4-A assembly	1379-C	1-16	1379-D	1-16	1379-D	1379-D	1-16
54	1	*Disc	1380-D	6	1380-F	6	1380-H	1380-H	6
55	1	*End piece	1380-D	4	1380-F	4	1380-H	1380-H	4
56	1	Handle	1380-D	2	1380-F	2	1380-H	1380-H	2
57	1	*Handle shaft	1380-D	3	1380-F	3	1380-H	1380-H	3
58	1	Pin, 1/16"x-1 1/4" long	1379-C	16	1379-D	16	1379-D	1379-D	16
59	1	Pin, 1/4"x1 1/2" long	1379-C	14	1379-D	14	1379-D	1379-D	14
60	1	*Plunger	SC-D-1380-D	10	SC-D-1380-F	10	SC-D-1380-H	SC-D-1380-H	10
61	2	*Plunger	1380-D	11	1380-F	11	1380-H	1380-H	11
62	1	Screw, flt. hd. m, 4-40 x 1/4" long	1379-C	15	1379-D	15	1379-D	1379-D	15
63	4	*Spring	1380-D	8	1380-F	8	1380-H	1380-H	8
64	1	*Spring	1380-D	9	1380-F	9	1380-H	1380-H	9
65	1	Stop	1380-D	7	1380-F	7	1380-H	1380-H	7
66	1	Stop	1380-D	12	1380-F	12	1380-H	1380-H	12
67	1	Stop	1380-D	13	1380-F	13	1380-H	1380-H	13
68	1	*Tube	1380-B						
ENGINE ASSEMBLY (see detailed engine list of replacement parts below)									
69	1	Carburetor shield	SC-D-1651-B	3	SC-D-1651-D	3	SC-D-1652-C	SC-D-1652-E	6
70	1	Engine (see par. 7)	1652-B	1	1652-B	1	1651-G	1651-G	3
71	1	Exhaust pipe	1651-B	5	1651-D	5	1652-C	1652-E	1
72	1	Nipple, 3/4" x 2 1/2" long					1651-G	1651-G	5

* These articles are a part of an assembled unit and should not be ordered separately.
1 Modified for muffler.

SIGNAL CORPS

A Line No.	B Num- ber re- quired for each unit	C Item	D Units built on order No. 7224-Chi.		E Units built on order No. 8233-Chi.		F Units built on order No. 9787-Chi.-39		G Units built on orders No. 1378-Chi.-40 No. 206-Chi.-41 No. 599-Chi.-41 No. 204-Chi.-41 No. 693-Chi.-41	
			Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.
74	1	Spring.....	1652-B	2	1652-B	2	1652-C	2	1652-E	2
75	1	Straight banded elbow.....	1651-B	4	1651-D	4	1651-G	4	1651-G	4
76		FRAME								
77	1	Base.....	SC-D-1628-B	1	SC-D-1628-B	1	SC-D-1628-C	1	SC-D-1628-C	1
78	1	Brace.....	1632-A	13	1632-A	13	1632-C	13	1632-E	13
79	2	Bearing.....	1631-A	4	1631-B	4	1631-C	4	1631-D	4
80	1	Bracket.....	1629-A	2	1629-B	2	1629-C	2	1629-C	2
81	1	Bracket.....	1630-B	3	1630-B	3	1630-C	3	1630-D	3
82	1	Clamp.....	1631-A	11	1631-B	11	1631-C	11	1631-D	11
83	1	Crank block.....	1631-A	10	1631-B	10	1631-C	10	1631-D	10
84	1	Frame assembly.....	1627-A	1-37	1627-B	1-37	1627-C	1-37	1627-E	1-37
85	1	Instruction plate.....	1632-A	15	1632-A	15	1632-C	15	1632-E	15
86	1	Lift assembly (upper loading cradle).....	1631-A	2 ea. 8 1 ea. 9	1631-B	2 ea. 8 1 ea. 9	1631-C	2 ea. 8 1 ea. 9	1631-D	2 ea. 8 2 ea. 9
87	1	Lift assembly (lower loading cradle).....	1631-A	2 ea. 8 1 ea. 9	1631-B	2 ea. 8 1 ea. 9	1631-C	2 ea. 37 1 ea. 9	1631-D	2 ea. 37 2 ea. 9
88	2	*Lift pipe.....	1631-A	9	1631-B	9	1631-C	9	1631-D	9
89	1	Name plate.....	1632-A	14	1632-A	14	1632-C	14	1632-E	14
90	18	Nut, hex., std., 5/16"-18.....	1627-A	28	1627-B	28	1627-C	28	1627-E	28
91	2	Nut, hex., std., 3/8"-16.....	SC-D-1627-A	29	SC-D-1627-B	29	SC-D-1627-C	29	SC-D-1627-E	29
92	4	Nut, hex., std., 1/16"-14.....	1627-A	30	1627-B	30	1627-C	30	1627-E	30
93	2	Nut, square, std., 10-32.....	1627-A	26	1627-B	26	1627-C	26	1627-E	26
94	4	Nut, square, std., 1/4"-20.....	1627-A	27	1627-B	27	1627-C	27	1627-E	27
95	8	Pin, escutcheon, std., No. 14 x 1/2".....	1627-A	22	1627-B	22	1627-C	22	1627-E	22

96	2	Pins, taper, No. 4 x 2" long	1627-A	17	1627-B	17	1627-C	17	1627-E
97	10	Rivet, rd. hd., 1/4" x 3/4" long	1627-A	36	1627-B	36	1627-C	36	1627-E
98	1	Screw, hex. hd. m., std., 5/16"-18 x 3/4" long	1627-A	18	1627-B	18	1627-C	18	1627-E
99	9	Screw, hex. hd. m., std., 5/16"-18 x 1 1/2" long	1627-A	19	1627-B	19	1627-C	19	1627-E
100	8	Screw, hex. hd. m., std., 5/16"-18 x 1 3/4" long	1627-A	20	1627-B	20	1627-C	20	1627-E
101	4	Screw, hex. hd. m., std., 7/16"-14 x 1 1/2" long	1627-A	21	1627-B	21	1627-C	21	1627-E
102	2	Screw, rd. hd. m., std., 10-32 x 2" long	1627-A	24	1627-B	24	1627-C	24	1627-E
103	4	Screw, rd. hd. m., std., 1/4"-20 x 7/8" long	1627-A	25	1627-B	25	1627-C	25	1627-E
104	2	Screw, square hd. m., std., 3/8"-16 x 2 1/4" long	1627-A	23	1627-B	23	1627-C	23	1627-E
105	1	Shaft, upper lift	1631-A	5	1631-B	5	1631-C	5	1631-D
106	1	Shaft, lower lift	1631-A	6	1631-B	6	1631-C	6	1631-D
107	2	Spacer, lift shafts	1631-A	7	1631-B	7	1631-C	7	1631-D
108	2	Tank clamp	1631-A	12	1631-B	12	1631-C	12	1631-D
109	1	*Track, upper	1631-A	2 ea. 8	1631-B	2 ea. 8	1631-C	8	1631-D
110	1	*Track, lower	1631-A	31	1631-B	31	1631-C	37	1631-D
111	2	Washer, split spring, No. 10 std.	1631-A	32	1631-B	32	1631-C	31	1631-D
112	4	Washer, split spring, 1/4" std.	1631-A	33	1631-B	33	1631-C	32	1631-D
113	18	Washer, split spring, 5/16" std.	1631-A	34	1631-B	34	1631-C	33	1631-D
114	2	Washer, split spring, 3/8" std.	1631-A	35	1631-B	35	1631-C	34	1631-D
115	10	Washer, split spring, 7/16" std.	1631-A	35	1631-B	35	1631-C	35	1631-D
116		MISCELLANEOUS FOR GENERAL ASSEMBLY							
117	1	Ground lead	SC-D-1626-A	14	SC-D-1626-B	14	SC-D-1626-C	14	SC-D-1626-C
118	10	Nut, hex., 7/16"-14 std.	1624-B	12	1624-C	12	1624-E	12	1624-E
119	4	Screw, hex. hd. m., 7/16"-14 x 1 1/4" long	1624-B	11	1624-C	11	1624-E	11	1624-E
120	6	Screw, hex. hd. m., 7/16"-14 x 1 3/4" long	1624-B	10	1624-C	10	1624-E	10	1624-E
121	10	Washer, split spring, std., 7/16"	1624-B	13	1624-C	13	1624-E	13	1624-E
122		SKID							
123	2	*End pipe	SC-D-1633-A	2	SC-D-1633-C	2	SC-D-1633-D	2	SC-D-1633-E
124	4	*Cleat	1633-A	4	1633-C	4	1633-D	4	1633-E
125	4	Corner joints	SC-D-1633-A	3	SC-D-1633-C	3	SC-D-1633-D	3	SC-D-1633-E
126	2	End pipe and corner joints assembly	1633-A	1 ea. 2 2 ea. 3	1633-C	1 ea. 2 2 ea. 3	1633-D	1 ea. 2 2 ea. 3	1633-E
127	2	*Side pipe	1633-A	1	1633-C	1	1633-D	1	1633-E

•These articles are a part of an assembled unit and should not be ordered separately.

A	B	C	D		E		F		G
Line No.	Num-ber re-quired for each unit	Item	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Units built on orders No. 1378-Chi.-40 No. 206-Chi.-41 No. 599-Chi.-41 No. 204-Chi.-41 No. 693-Chi.-41
SKID—Continued									
128	1	Side pipe and cleat assembly, left side.....	1633-A	1 ea. 1 2 ea. 4	1633-C	1 ea. 1 2 ea. 4	1633-D	1 ea. 1 2 ea. 4	1633-E
129	1	Side pipe and cleat assembly, right side.....	1633-A	1 ea. 1 2 ea. 4	1633-C	1 ea. 1 2 ea. 4	1633-D	1 ea. 1 2 ea. 4	1633-E
130	1	Skid assembly.....	1633-A	1-5	1633-C	1-5	1633-D	1-5	1633-E
131	8	*Rivet, csk. hd., $\frac{3}{16}$ x $1\frac{1}{2}$ "							1 ea. 1 2 ea. 4
132	8	*Rivet, rd. hd., $\frac{3}{16}$ x $1\frac{1}{8}$ "	1633-A	5	1633-C	5	1633-D	5	1 ea. 1 2 ea. 4
TANK, FUEL									
133	1	*Body.....	SC-D-1655-B	1	SC-D-1655-B	1	SC-D-1655-D	1	SC-D-1655-E
134	1	*Bushing, brass.....	1655-B	4	1655-B	4	1655-D	4	1655-E
135	1	Cap, C. D. steel.....	1655-B	6	1655-B	6	1655-D	6	1655-E
136	1	*Cap, Everdur.....	1655-B	2	1655-B	2	1655-D	2	1655-E
137	2	Chain, 4 inches long.....					1654-D	16	1654-F
138	1	Cock, shut-off.....	1654-B	12	1654-B	12			14
139	1	Collar, brass.....					1655-D	14	1655-E
140	1	Eyelet, Waterbury Button Co., No. 6919.....					1654-D	17	1654-F
141	1	Filter, Zenith Carburetor Co., No. F341.....					1654-D	12	1654-F
142	1	*Fitting, Weatherhead Co., No. A-4203.....					1654-D	11	1654-F
143	1	*Fitting, Weatherhead Co., No. A-4412.....	1654-B	11	1654-B	11	1654-D	10	1654-F
144	1	Fuel line assembly.....	1654-B	10	1654-B	10	1654-D	9, 10, 11	1654-F
145	1	*Hose, oilproof, $\frac{1}{4}$ ", Weatherhead Co.....	1654-B	9, 10, 11	1654-B	9, 10, 11	1654-D	9, 10, 11	1654-F
146	9	Nut.....	1654-B	9	1654-B	9	1654-D	9	1654-F
147	1	Retainer.....	1655-B	5	1655-B	5	1655-D	5	1655-E
148	1	Rivet, rd. hd., $\frac{3}{16}$ x $1\frac{1}{2}$ " long.....	1655-B	7	1655-B	7	1655-D	7	1655-E
149	1						1654-D	19	1654-F

REEL UNITS RL-26 AND RL-26-A

		1655-B	8	1655-B	8	1655-D	8	1655-E	8
150	Screen.....							1655-E	8
151	Sleeve.....							1655-E	13
152	Strainer.....							1655-E	15
153	Tank assembly, fuel.....	1654-B	1-12	1654-B	1-12	1654-D	1-12	1654-F	1-19
154	*Tube.....	1655-B	3	1655-B	3	1655-D	3	1655-E	3
155	Washer, std. for No. 4 screw.....					1654-D	18	1654-F	13
156	TOP REEL SHAFT CLUTCH								
157	Arbor.....	1646-B	29	1646-B	29	1646-C	29	1646-C	29
158	Arbor stop.....	SC-D-1643-A	3	SC-D-1643-A	3	SC-D-1643-B	3	SC-D-1643-C	3
159	Bearing.....	1643-A	4	1643-A	4	1643-B	4	1643-C	4
160	Bearing.....	1643-A	5	1643-A	5	1643-B	5	1643-C	5
161	Bearing cap.....	1643-A	1	1643-A	1	1643-B	1	1643-C	1
162	Block.....	1645-A	27	1645-A	27	1645-C	27	1645-C	27
163	Bracket.....	1645-A	18	1645-B	18	1645-C	18	1645-C	18
164	Bracket.....	1645-A	19	1645-B	19	1645-C	19	1645-C	19
165	Bushing.....	1643-A	2	1643-A	2	1643-B	2	1643-C	2
166	Bushing.....	1643-A	6	1643-A	6	1643-B	6	1643-C	6
167	Clutch ring.....	1644-B	8	1644-C	8	1644-D	8	1644-F	8
168	Collars.....	1644-B	17	1644-C	17	1644-D	17	1644-F	17
169	Handle.....	1645-A	21	1645-B	21	1645-C	21	1645-C	21
170	Handle.....	1645-A	24	1645-B	24	1645-C	24	1645-C	24
171	Latch.....	1644-B	10	1644-C	10	1644-D	10	1644-F	10
172	Latch guide.....	1644-B	11	1644-C	11	1644-D	11	1644-F	11
173	Lever arm.....	1645-A	25	1645-B	25	1645-C	25	1645-C	25
174	Lever arm.....	1645-A	26	1645-B	26	1645-C	26	1645-C	26
175	Lock plate.....	1644-B	9	1644-C	9	1644-D	9	1644-F	9
176	Nut, castellated, std., 1/4"-28.....	1642-A	42	1642-B	42	1642-C	42	1642-C	42
177	Nut, hex., std., 5/16"-18.....	1642-A	43	1642-B	43	1642-C	43	1642-C	43
178	Nut, hex., std., 3/8"-16.....	1642-A	44	1642-B	44	1642-C	44	1642-C	44
179	Oil hole cover, GITS style "GB" No. 526.....	1642-A	48	1642-B	48	1642-C	48	1642-C	48
180	Pawl.....	1645-A	20	1645-B	20	1645-C	20	1645-C	20
181	Pin.....	1644-B	12	1644-C	12	1644-D	12	1644-F	12
182	Pin.....	1644-B	13	1644-C	13	1644-D	13	1644-F	13
183	Pin, cotter, 1/16"x3/4" long.....	1642-A	32	1642-B	32	1642-C	32	1642-C	32
184	Pin, cotter, 1/8"x1" long.....	1642-A	33	1642-B	33	1642-C	33	1642-C	33
185	Rivet, rd. hd., 1/4"x1" long.....	1642-A	31	1642-B	31	1642-C	31	1642-C	31

*These articles are a part of an assembled unit and should not be ordered separately.

SIGNAL CORPS

A	B	C	D		E		F		G	
			Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.		
Line No.	Num-ber re-quired for each unit	Item	Units built on order No. 7224-Chl.		Units built on order No. 8283-Chl.		Units built on order No. 9787-Chl.-39		Units built on orders No. 1378-Chl.-40 No. 206-Chl.-41 No. 699-Chl.-41 No. 204-Chl.-41 No. 693-Chl.-41	
TOP REEL SHAFT CLUTCH—Con.										
186	1	Screw.....	1644-B	14	1644-C	14	1644-D	14	1644-F	14
187	2	Screw.....	1645-A	28	1645-B	28	1645-C	28	1645-C	28
188	2	Screw, flt. hd. m., std., 10-32x $\frac{3}{4}$ " long.....	1642-A	34	1642-B	34	1642-C	34	1642-C	34
189	1	Screw, flt. hd. m., std., 10-32x $\frac{3}{4}$ " long.....	1642-A	35	1642-B	35	1642-C	35	1642-C	35
190	4	Screw, flt. hd. m., std., $\frac{1}{4}$ "-20x $\frac{1}{4}$ " long.....	1642-A	36	1642-B	36	1642-C	36	1642-C	36
191	1	Screw, hex. hd. m., std., $\frac{5}{16}$ "-18x1" long.....	1642-A	38	1642-B	38	1642-C	38	1642-C	38
192	4	Screw, hex. hd. m., std., $\frac{3}{8}$ "-16x $\frac{3}{4}$ " long.....	1642-A	39	1642-B	39	1642-C	39	1642-C	39
193	4	Screw, hex. hd. m., std., $\frac{3}{8}$ "-16x1 $\frac{1}{4}$ " long.....	1642-A	40	1642-B	40	1642-C	40	1642-C	40
194	4	Screw, hex. hd. m., std., $\frac{3}{8}$ "-16 x 3 $\frac{1}{4}$ " long.....	SC-D-1642-A	41	SC-D-1642-B	41	SC-D-1642-C	41	SC-D-1642-C	41
195	4	Screw, rd. hd. m., std., 10-32 x $\frac{5}{8}$ " long.....	1642-A	37	1642-B	37	1642-C	37	1642-C	37
196	1	Shaft.....	1645-A	23	1645-B	23	1645-C	23	1645-C	23
197	1	Spacer.....	1644-B	16	1644-C	16	1644-D	16	1644-F	16
198	1	Spacer.....	1646-B	30	1646-B	30	1646-C	30	1646-C	30
199	1	Spring.....	1644-B	15	1644-C	15	1644-D	15	1644-F	15
200	1	Sprocket.....	1644-B	7	1644-C	7	1644-D	7	1644-F	7
201	1	Stud.....	1645-A	22	1645-B	22	1645-C	22	1645-C	22
202	1	Top reel shaft clutch assembly.....	1642-A	1-48	1642-B	1-49	1642-C	1-49	1642-C	1-49
203	4	Washer, flat, std., $\frac{3}{8}$ ".....	1642-A	45	1642-B	45	1642-C	45	1642-C	45
204	4	Washer, lock, std., No. 10.....	1642-A	46	1642-B	46	1642-C	46	1642-C	46
205	1	Washer, lock, std., $\frac{1}{16}$ ".....	1642-A	47	1642-B	47	1642-C	47	1642-C	47
206	12	Washer, lock, std., $\frac{3}{8}$ ".....	1642-A	47	1642-B	47	1642-C	47	1642-C	47
TRANSMISSION										
207										
208	1	Arbor stop.....	SC-D-1643-A	3	SC-D-1643-A	3	SC-D-1643-B	3	SC-D-1643-C	3
209	1	Bearing, SKF No. 6203.....	1634-B	66	1634-C	66	1634-D	66	1634-E	66

SIGNAL CORPS

A	B	C	D		E		F		G	
Line No.	Number required for each unit	Item	Units built on order No. 7224-Chl.		Units built on order No. 8233-Chl.		Units built on order No. 9787-Chl.-39		Units built on orders No. 1378-Chl.-40 No. 206-Chl.-41 No. 599-Chl.-41 No. 204-Chl.-41 No. 693-Chl.-41	
			Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.
TRANSMISSION—Continued										
249	2	Nut, castellated, SAE, 1/4"-28	1634-B	94	1634-C	94	1634-D	94	1634-E	94
250	4	Nut, castellated, std., 3/8"-24	1634-B	93	1634-C	93	1634-D	93	1634-E	93
251	5	Nut, hex., std., 1/4"-20	1634-B	92	1634-C	92	1634-D	92	1634-E	92
252	4	Nut, hex., std., 3/8"-16	1634-B	91	1634-C	91	1634-D	91	1634-E	91
253	2	Oil hole cover, GITS, No. GB526	1634-B	68	1634-C	68	1634-D	68	1634-E	68
254	1	Oil seal, Chicago Rawhide Co., No. 13724	1634-B	67	1634-C	67	1634-D	67	1634-E	67
255	As req.	Packing	1634-B	72	1634-C	72	1634-D	72	1634-E	72
256	1	Plug, pipe, with screw driver slot	1634-B	78	1634-C	78	1634-D	78	1634-E	78
257	1	Plug, pipe, with screw driver slot	1634-B	77	1634-C	77	1634-D	77	1634-E	77
258	1	Plug, pipe, with screw driver slot	1634-B	76	1634-C	76	1634-D	76	1634-E	76
259	2	Pin	1639-B	35	1639-C	35	1639-D	35	1639-F	35
260	1	Pin	1644-B	12	1644-C	12	1644-D	12	1644-F	12
261	1	Pin	1644-B	13	1644-C	13	1644-D	13	1644-F	13
262	2	Pin, cotter, 1/16" x 3/4" long	1634-B	105	1634-C	105	1634-D	105	1634-E	105
263	4	Pin, cotter, 3/32" x 1" long	1634-B	104	1634-C	104	1634-D	104	1634-E	104
264	2	Pin, cotter, 1/8" x 3/4" long	1634-B	103	1634-C	103	1634-D	103	1634-E	103
265	4	Pin, cotter, 3/32" x 1" long	1634-B	102	1634-C	102	1634-D	102	1634-E	102
266	1	Reel shaft	1639-B	29	1639-C	29	1639-D	29	1639-F	29
267	6	Rivet, ctsk. hd., 1/4" x 3/4" long	1634-B	108	1634-C	108	1634-D	108	1634-E	108
268	2	Rivet, rd. hd., 1/4" x 5/8" long	1634-B	107	1634-C	107	1634-D	107	1634-E	107
269	2	Rivet, rd. hd., 1/4" x 7/8" long	1634-B	106	1634-C	106	1634-D	106	1634-E	106
270	1	Screw	1644-B	14	1644-C	14	1644-D	14	1644-F	14
271	2	Screw	1645-A	28	1645-B	28	1645-C	28	1645-C	28
272	6	Screw, fl. hd. m., 1/4"-20 x 5/8" long	1634-B	85	1634-C	85	1634-D	85	1634-E	85

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273	4	Screw, flt. hd. m., 10-24 x 5/8" long.	1634-B	90	1634-C	1634-D	90	1634-D	90	1634-D
274	2	Screw, flt. hd. m., 10-32 x 3/4" long	1634-B	87	1634-C	1634-D	87	1634-D	87	1634-D
275	1	Screw, flt. hd. m., 10-32 x 5/8" long	1634-B	86	1634-C	1634-D	86	1634-D	86	1634-D
276	4	Screw, flt. hd. m., 1/4"-20 x 3/4" long.	1634-B	84	1634-C	1634-D	84	1634-D	84	1634-D
277	3	Screw, hex. hd. m., 1/4" - 20 x 5/8" long.	1634-B	83	1634-C	1634-D	83	1634-D	83	1634-D
278	2	Screw, hex. hd. m., 1/4"-20 x 1 1/4" long.	1634-B	82	1634-C	1634-D	82	1634-D	82	1634-D
279	8	Screw, hex. hd. m., 5/16"-18 x 3/4" long.	1634-B	81	1634-C	1634-D	81	1634-D	81	1634-D
280	2	Screw, hex. hd. m., 3/8"-16 x 3/4" long.	1634-B	80	1634-C	1634-D	80	1634-D	80	1634-D
281	10	Screw, hex. hd. m., 3/8"-16 x 1 1/4" long	1634-B	79	1634-C	1634-D	79	1634-D	79	1634-D
282	2	Screw, rd. hd. m., 10-32 x 1/4" long.	1634-B	89	1634-C	1634-D	89	1634-D	89	1634-D
283	4	Screw, rd. hd. m., 10-32 x 3/4" long.	1634-B	88	1634-C	1634-D	88	1634-D	88	1634-D
284	1	Shaft puller.	1639-B	30	1639-C	1639-D	30	1639-F	30	1639-F
285	2	Shaft puller spring.	1639-B	31	1639-C	1639-D	31	1639-F	31	1639-F
286	2	Shipper block.	1639-B	22	1639-B	1639-C	22	1639-H	22	1639-H
287	2	Shipper shaft.	1641-A	47	1641-A	1641-B	47	1641-B	47	1641-B
288	1	Shipper shaft.	1641-A	48	1641-A	1641-B	48	1641-B	48	1641-B
289	4	Shipper shoe.	1638-B	26	1638-B	1638-C	26	1638-H	26	1638-H
290	4	Shipper shoe screw.	1641-A	49	1641-A	1641-B	49	1641-B	49	1641-B
291	1	Spacer.	1644-B	16	1644-C	1644-D	16	1644-F	16	1644-F
292	1	Spring.	1640-A	45	1640-B	1640-C	45	1640-C	45	1640-C
293	1	Spring.	1644-B	15	1644-C	1644-D	15	1644-F	15	1644-F
294	1	Spring guide.	1641-A	51	1641-A	1641-B	51	1641-B	51	1641-B
295	1	Sprocket.	1637-A	19	1637-B	1637-C	19	1637-F	19	1637-F
296	1	Stirrup.	1640-A	43	1640-B	1640-C	43	1640-C	43	1640-C
297	1	Street elbow, 3/4" x 90°	1634-B	75	1634-C	1634-D	75	1634-D	75	1634-D
298	1	Support.	SC-D-1640-A	39	SC-D-1640-B	SC-D-1640-C	39	SC-D-1640-C	39	SC-D-1640-C
299	1	Thrust plate.	1637-A	14	1637-B	1637-C	14	1637-F	14	1637-F
300	1	Thrust plate.	1637-A	15	1637-B	1637-C	15	1637-F	15	1637-F
301	1	Transmission assembly	1634-B	1-108	1634-C	1634-D	1-108	1634-D	1-108	1634-D
302	1	Transmission base.	1635-A	1	1635-B	1635-C	1	1635-D	1	1635-D
303	1	Washer.	1636-B	6	1636-C	1636-D	6	1636-F	6	1636-F
304	1	Washer.	1636-B	7	1636-C	1636-D	7	1636-F	7	1636-F
305	1	Washer.	1636-B	8	1636-C	1636-D	8	1636-F	8	1636-F
306	1	Washer.	1636-B	9	1636-C	1636-D	9	1636-F	9	1636-F
307	2	Washer, leather.	1637-A	20	1637-B	1637-C	20	1637-F	20	1637-F
308	2	Washer, std., 1/4"	1634-B	97	1634-C	1634-D	97	1634-D	97	1634-D
309	2	Washer, std., for 3/8" shaft.	1634-B	96	1634-C	1634-D	96	1634-D	96	1634-D

A	B	C	D		E		F		G	
Line No.	Number required for each unit	Item	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.	Signal Corps drawing number	Item No.
		TRANSMISSION—Continued								
310	4	Washer, std., for ½" shaft.....	1634-B	95	1634-C	95	1634-D	95	1634-D	95
311	2	Washer, split spring, std., No. 10.....	1634-B	101	1634-C	101	1634-D	101	1634-D	101
312	11	Washer, split spring, std., ¼".....	1634-B	100	1634-C	100	1634-D	100	1634-D	100
313	8	Washer, split spring, std., ⅜".....	1634-B	99	1634-C	99	1634-D	99	1634-D	99
314	12	Washer, split spring, std., ⅝".....	1634-B	98	1634-C	98	1634-D	98	1634-D	98
315	1	Worm.....	1637-A	11	1637-B	11	1637-C	11	1637-F	11
316	1	Worm gear.....	1637-A	10	1637-B	10	1637-C	10	1637-F	10

44. List of replacement parts of Lauson RAY-843 engine.—
a. Air cleaner.

Number required	Item	Lauson part No.
1	Cleaner, air, Donaldson Co. P1303 with intake pipe and two No. 8-32x1-½" brass screws.	RA-413

b. Base group.

1	Base.....	RA15-F.
1	Base assembly.....	RA1000-2.
1	Piston assembly, oil pump. Replaces Lauson part RA1067-1.	RA1366.
1	Plug, pipe, ¼" oil drain.....	2Z.
1	Plug, pipe, ¼" oil filler.....	6Z (formerly 4Z).
1	Pump assembly, oil. Replaces Lauson part RA1046-2.	RA1193.
1	Screen, oil strainer.....	RA478.
1	Spring, oil pump, large.....	RA375-B.
1	Spring, oil pump, small.....	RA377.
4	Stud, crankcase to base.....	RA41-A.

c. Blower housing group.

1	Housing, blower, assembled.....	RA1073-3.
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d. Breather group.

1	Breather assembly.....	RA1077-2.
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e. Carburetor maintenance parts for Tillotson carburetors MS-74-B and MS-74-C. (See note q below for exceptions.)

Number required	Item	Tillotson part No.
1	Gasket.....	02410.
1	Connection, inlet.....	03453.
1	Cover assembly, float bowl. Replaces Tillotson part 04048.	04971.
1	Float.....	01459.
1	Gasket, float bowl cover.....	01845.
1	Gasket, inlet seat.....	0337.
1	Gasket, main jet.....	02817.
1	Gasket, stuffing box gland.....	0676.
1	Lever and swivel, choke, assembled.....	05994.
1	Lever assembly, choke.....	04911.

Number required	Item	Tillotson part No.
1	Needle and seat, matched.....	04050.
1	Nozzle.....	04112.
1	Nut, stuffing box.....	0703.
1	Packing, stuffing box.....	0705.
1	Pin, choke stop lever retaining, Lauson part RA-252.....	Q3208.
1	Pin, float level.....	Q3369.
1	Plug, pipe, headless, $\frac{1}{8}$ inch.....	Q2744.
1	Screen, inlet connection.....	Q802.
1	Screw, adjusting.....	Q3076.
4	Screw, float bowl cover vent.....	Q1434.
1	Screw, inlet connection.....	Q2409.
4	Screw, 8-32 x $\frac{1}{2}$ " long.....	Q54.
1	Shaft, throttle.....	Q5553.
1	Shutter, throttle.....	Q4119.
1	Spring, choke lever return.....	Q4122.
1	Spring, throttle adjusting screw.....	Q788.
1	Washer, lock, for No. 8 machine screw.....	Q992.

f. Connecting rod and piston group.

Number required	Item	Lauson part No.
2	Bolt, connecting rod, (machine $\frac{5}{16}$ "-24x1- $\frac{5}{16}$ " long).....	RA 89.
1	Bushing, piston pin.....	RA 48.
1	Dipper, connecting rod, oil. Purchased on order 4822-Chi. only. On later orders this part was integral with connecting rod.	RA 128.
2	Nut, connecting rod bolt, hex. steel castellated, $\frac{5}{16}$ "-24.	5-M.
1	Pin, piston.....	RA 27.
1	Piston.....	RA 5.
1	Ring, piston, compression.....	RA 14.
1	Ring, piston, oil retaining.....	RA 111.
1	Ring, piston, oil scraper.....	RA 484.
2	Ring, piston pin retaining.....	RA 23.
1	Ring, piston, <i>plus 0.005</i> ".....	RA 14.
1	Rod, connecting, assembly. This assembly has connecting rod, Lauson part RA25-A, which has dipper integral with the lower bearing cap. Replaces Lauson part RA1014-1.	RA 1025-1.
2	Washer, connecting rod bolt.....	RA 94.

g. Crankcase end plate group.

Number required	Item	Lauson part No.
1	Cup, bearing, Timken.....	RA 427.
1	End plate assembly, crankcase.....	RA 1076-3.
1	Gear, starter retard.....	RA 274.
1	Spring, starter retard gear.....	RA 280.
1	Stud, starter retard gear.....	RA 277.
1	Washer, retard gear spring.....	RA 415.

h. Crankshaft group.

2	Cone, bearing, Timken.....	RA 428.
1	Crankshaft.....	RA 24-D.
1	Crankshaft assembly.....	RA 1008-2.
1	Gear, timing, crankshaft.....	RA 12.
1	Pin, timing gear.....	RA 103.

i. Cylinder group.

2	Cap, intake and exhaust valve.....	RA 50.
2	Cup, intake and exhaust valve spring.....	RA 72.
1	Cylinder.....	RA 1- E.
1	Cylinder assembly.....	RA 1078-5.
1	Gasket, valve spring cover.....	RA 217-A.
1	Gear, cam.....	RA 26-B.
2	Guide, intake and exhaust valve.....	RA 197-A.
2	Key, intake and exhaust valve cap.....	RA 258-A.
3	Lifter, intake and exhaust valve.....	RA 65-A.
2	Spring, intake and exhaust valve.....	RA 57-A.
6	Stud, cylinder head.....	RA 68-A.
1	Stud, cam gear.....	RA 28-B.
4	Stud, crankcase end plate.....	RA 61.
1	Valve, intake and exhaust.....	RA 20-A.
1	Valve, exhaust.....	RA 20-A (formerly RA 66-A).

j. Fuel pipe group.

1	Bushing, fuel tank—SC-D-1655-det. 4.....	
1	Cock, shut-off, fuel line ($\frac{1}{8}$ " T-handle; G. Edelman Co., 148E). Replaces but is not interchangeable with Lauson part RA-307—SC-D-1654 det. 12.	
1	Nut, fuel tank—SC-D-1655-det.-5.....	

Number required	Item	Lauson part No.
1	Pipe, fuel, assembled. Replaces but is not interchangeable with Lauson part RA-1047—SC-D-1654 det. 9 to 11, inclusive.	RA-409-B.
1	Strap, fuel tank.....	

k. Fuel tank group.

1	Cap, fuel filler—SC-D-1655 det. 6.....	Replaces Lauson part RA 1096.
1	Plug (cap) assembly, fuel tank—SC-D-1655 det. 6, 7, and 8.	
1	Screen, fuel filler plug—SC-D-1655 det. 8.....	
1	Tank, fuel, includes filler plug with retainer and screen. Replaces Lauson tank and fuel line when used with fuel pipe (SC-D-1654 det. 9 to 11, inclusive), and cock (SC-D-1654 det. 12)—SC-D-1654 det. 1-8, inclusive, assembled.	

l. Gear and starter group.

1	Bracket, starter.....	RA 189-A.
1	Clip, intermediate gear spring.....	RA 282-A.
1	Key, Woodruff, $\frac{3}{16}$ x $\frac{3}{4}$ " long. Replaces Lauson part A-Y-04.	6-Y-6.
1	Member, starter hinge.....	RA 191.
3	Nut, SAE, hex. full, $\frac{3}{8}$ " starter bracket stud.....	6-K.
1	Pedal, foot starter.....	RA 190-A.
1	Pin, cotter (see "Spacer" below).....	8-P-03.
1	Pin, sector stop.....	RA 281-A.
1	Sector, starter.....	RA-271.
1	Shaft, starter.....	RA-278.
1	Spacer, steel. Replaces cotter pin Lauson part No. 8-P-03 furnished as original equipment on orders 4822-Chi. and 9944-NY-35—SC-D-1700 det. 5.	
1	Spring assembly. Replaces spring, Lauson part RA-182 furnished as original equipment on orders 4822-Chi. and 9944-NY-35—SC-D-1700 dets. 1 to 4, inclusive.	
1	Spring, intermediate gear.....	RA-287.
1	Spring, starter return. Used only on equipment in which the "Spring assembly," above, has not been installed.	RA-182.

Number required	Item	Lauson part No.
1	Spring, starter return. Used in lieu of "Spring, starter return" above in Lauson engine RAY-843 in which "Spring assembly" above has previously been installed--SC-D-1700 det. 2.	
1	Starter gear assembly.....	RA-1082-2.
1	Stud, starter spring.....	RA-150-A.

m. Intake pipe group.

1	Lever and shaft assembly, speed check throttle.....	RA-560 and RA-561.
1	Pipe, intake.....	RA-319-B.
1	Rod, speed check throttle.....	RA-563.
1	Shutter, speed check throttle.....	RA-559.
1	Spring, speed check throttle.....	RA-570.

n. Intermediate starter gear group.

1	Gear assembly, starter, intermediate.	RA-1089-1.
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o. Magneto, Wico E. Co., FGB-874, Lauson part RA-358-B.

Number required	Item	Wico E. Co. part No.	Lauson part No.
1	Arm assembly, breaker, with stationary contact point and nut.	18X142D.....	RA-5004.
1	Breaker and capacitor assembly.....	X-2393.....	RA-5003.
1	Bushing, breaker arm.....	16-791.....	RA-5025.
1	Capacitor.....	X-2394.....	RA-5016.
1	Coil assembly, left hand side.....	18-X123C.....	RA-5002.
1	Coil assembly, right hand side.....	18-X123D.....	RA-5001.
1	Contact point, stationary, with nut.....	16-X301B.....	RA-5015.
1	Magnet, permanent.....	2274.....	RA-5010.
1	Magneto, ignition.....	FGB-874.....	RA-358-B.
1	Nut, pivot, breaker arm.....	M75X.....	RA-5017.
1	Rotor assembly. For Wico E. Co., magneto FGB spec. 874.	X-2374.....	RA-5005.
1	Screw, adjusting, breaker arm.....	18-797.....	RA-5027.
1	Spacer (washer), breaker arm.....	18-790.....	
1	Spacer (washer), breaker arm, insulating.	M-38X.....	RA-5024.

Number required	Item	Wico E. Co. part No.	Lauson part No.
1	Spring, breaker arm.....	18-792A.....	RA-5026.
1	Washer, capacitor insulating.....	M-30X.....	RA-5008.
1	Wire, lead, ground.....	A-393.....	RA-5031.

p. Main bearing housing group.

Number required	Item	Lauson part No.
1	Cup, bearing, Timken.....	RA-427

q. Miscellaneous parts.

1	Carburetor, Tillotson MS-74-B (venturi size $\frac{1}{16}$ ""); for Lauson engine RAY-843 purchased on orders 4822-Chi., and 9944-NY-35; replaced by "Carburetor, Tillotson MS-74-C" below. (See note below.)	
1	Carburetor, Tillotson MS-74-C (venturi size $\frac{1}{16}$ ""); for Lauson engine RAY-843. (See note below.)	LW-202-B.
1	Flywheel.....	RA-13-A.
1	Gasket, base.....	RA-132-B.
1	Gasket, breather body.....	RA-397-A.
1	Gasket, carburetor.....	RA-295.
1	Gasket, crankcase end plate, thick.....	RA-121-A.
1	Gasket, crankcase end plate, thin. Need one of this gasket and one of gasket just above.	RA-246-A.
1	Gasket, cylinder head.....	RA-114-A.
1	Gasket, governor housing.....	RA-294.
1	Gasket, intake pipe.....	RA-293.
2	Gasket, main bearing housing.....	RA-126.
1	Gear, starter, crankshaft.....	RA-275-A.
1	Head, cylinder.....	RA-4-C.
1	Key, Woodruff, $\frac{3}{16}$ " x $\frac{3}{4}$ " long. Replaces Lauson part A-Y-04.	6-Y-6.
1	Nipple, exhaust, $\frac{3}{4}$ " x 2" long.....	RA-483.
	Nut, hex., steel castellated, $\frac{3}{16}$ "-24 (cadmium plated). For connecting rod bolts; for full cylinder to base studs.	5-M.

Number required	Item	Lauson part No.
	Nut, hex., steel, regular, $\frac{1}{16}$ "-24 (cadmium plated). For full cylinder to head stud and full crankcase end plate.	5-K.
	Nut, hex., steel, regular, $\frac{1}{16}$ "-18. For cam stud nut and for full flywheel nut.	9-K.
	Nut, SAE, hex., full, starter bracket studs.....	6-K.
1	Pipe, exhaust—SC-D-1652 det. 1.....	
1	Plug, spark.....	RA-359.
	Screw, cap, hex., $\frac{1}{4}$ "-20 x $\frac{1}{4}$ " long (cadmium plated). For cylinder hood top sheet.	4-C-04.
2	Screw, cap, hex., $\frac{1}{4}$ "-20 x $\frac{3}{4}$ " long (heavy cadmium plated). For carburetor intake pipe.	4-C-06.
2	Screw, cap, hex., $\frac{1}{16}$ " x $\frac{3}{4}$ " long (cadmium plated). For valve spring cover.	5-C-06.
	Screw, machine, $\frac{1}{4}$ "-20 x $1\frac{1}{4}$ " long, fil. H. (cadmium plates). For breather body group. Replaces Lauson parts 4-G-14 and 4-G-16.	4-G-112.
	Stud, intermediate gear.....	RA-276.
6	Washer, cylinder head stud.....	RA-261.
1	Washer, felt.....	RA-167.
2	Washer, fiber, $\frac{1}{4}$ ". For breather body screws. Replaces Lauson part 4-W.	RL-225.
16	Washer, lock, $\frac{1}{16}$ " (heavy cadmium plated)..... Part of the base group, crankcase end plate group, cylinder group, and governor assembly.	5-W.
1	Washer, retaining, felt.....	RA-133.

NOTE.—The carburetor, Tillotson MS-74-B, has the throttle lever removed from the throttle shaft and replaced with a clamp type of throttle lever. The carburetor, Tillotson MS-74-C, has the throttle shaft extended so that a clamp lever can be added, leaving the old throttle lever in place, but cutting off the lever and maintaining the stop screws. The difference between these two carburetors is in the length of the throttle shaft and the drilling of the air bleed hole in the carburetor body. The complete units are interchangeable as are the majority of maintenance parts. Exceptions are as follows:

Number required	Item	Tillotson part for MS-74-B	Tillotson part for MS-74-C
	Air bleed channel restriction screw or plug screw.	04139	052.
	Body.....	04868	05543.
	Throttle shaft.....	04123	05553.

r. Spark plug wire group.

Number required	Item	Tillotson part for M8-74-B	Tillotson part for M8-74-C
1	Wire assembly.....	-----	RA-1098.
1	Wire magneto for Wico E. Co. FGB magneto of engine RAY-843.	-----	RA-207.

s. Switch.

	Switch, ignition, toggle, SPST, Hart and Hegeman No. 20994-BQ; replacing and interchangeable with Hart and Hegeman No. 20992 and No. 20994-CN.		
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t. Topsheet group.

1	Bushing, switch wire.....	-----	RA-500.
1	Grommet.....	-----	RA-488.
1	Topsheet, cylinder hood, assembled.....	-----	RA-1091-5.

45. List of replacement parts of Lauson RAY-885 engine.—a.
Air cleaner and intake pipe group.

Number required	Item	Lauson part No.
1	Air cleaner, Donaldson No. Ex. 592.....	RA-413-E.
1	Air cleaner elbow.....	RA-383-G.
1	Choke lever, Tillotson No. 04911.....	RA-720.
1	Conduit bracket (Parkerized).....	RA-571-A.
1	Gasket, air cleaner elbow to carburetor.....	RA-230.
1	Gasket, air cleaner to elbow.....	RA-661.
1	Gasket, carburetor to intake pipe.....	RA-295.
1	Gasket, intake pipe.....	RA-293.
1	Intake pipe.....	RA-319-K.
1	Intake pipe assembly.....	RA-1319.
2	Lockwasher ¼", air cleaner elbow screws (Parkerized).	3-W.
2	Screws, fil. hd. m. 8-32 x 1-¾, air cleaner elbow to carburetor (Parkerized).	8-32 V18.
1	Screw, fil. hd. m. ¼-20 x 2-½ (Parkerized) air cleaner.	2-V28.
1	Screw, Tillotson No. 051.....	RA-724.

Number required	Item	Lauson part No.
4	Screw, USS hex. hd. cap. $\frac{1}{4}$ -20 x $\frac{3}{4}$, with head drilled for sealing wire, carburetor and intake pipe (Parkerized).	RA-687.
1	Shutter, Tillotson No. 04119	RA-722.
1	Stop pin, Tillotson No. 03517	RA-723.
1	Throttle lever, Tillotson No. 06493	RA-721.
1	Throttle shaft	RA-581.
1	Washer, fiber, air cleaner	RL-225.

b. Base group.

1	Ball, oil pump check $\frac{1}{16}$ "	10-AE.
1	Base	RA-15-N.
1	Base assembly	RA-1015-11.
1	Body, oil strainer	RA-477.
1	Chain, oil gage, 12 links (Parkerized)	RA-302-B.
1	Clip, oil gage rod chain (Parkerized)	RA-78.
4	Cotter pins—base nuts $\frac{1}{16}$ x $\frac{3}{4}$ "	4P-06.
1	Gasket, base	RA-132-B.
1	Gasket, oil filler plug	RL-86.
1	Guide, oil pump plunger	RA-426.
1	Link, oil gage rod chain (Parkerized)	RA-77.
3	Lockwashers, $\frac{1}{16}$ " (Parkerized)	5-W.
4	Nut, SAE hex. cast., cylinder to base $\frac{1}{16}$ -24 (Parkerized).	5-M.
1	Oil gage assembly	RA-1693.
1	Oil gage bushing assembly (Parkerized)	RA-2691.
1	Oil gage gasket	RA-701.
1	Oil gage rod with RA-694 cap (Parkerized)	RA-693.
1	Oil pump assembly	RA-1193.
1	Oil pump piston assembly	RA-1366.
1	Pan, oil splash	RA-193.
1	Plug, oil filler (Parkerized)	RL-85.
1	Plug, pipe $\frac{1}{4}$ " oil drain	2-Z.
1	Plunger, oil pump	RA-364-B.
1	Retainer, oil pump check ball	RA-368-A.
2	Retainer, oil strainer screen	RA-480.
1	Screen, oil strainer	RA-478.
1	Screw, rd. hd. mach. $\frac{1}{4}$ " x $\frac{3}{8}$ "	4V-06.
3	Screws, USS hex. hd. cap $\frac{1}{16}$ " x $\frac{3}{4}$ " (Parkerized)	5C-06.
1	Spring, oil pump, large	RA-375-B.
1	Spring, oil pump, small	RA-377.
4	Studs, crankcase to base (Parkerized)	RA-41-A.

c. Blower housing group.

Number required	Item	Lauson part No.
1	Blower housing assembly	RA-2104-18.

d. Breather group.

1	*Body, breather	RA-393-A.
1	Breather assembly	RA-1077-2.
1	*Disk, breather check	RA-381-A.
1	Gasket, breather body	RA-397-A.
	*Moss, Dixie	
1	*Screen, breather	RA-396-A.
2	Screw, breather, fil. hd. mach. $\frac{1}{4}$ "-20 x 1- $\frac{1}{4}$ " (Parkerized).	4-G-112.
2	*Spacer, breather screen	RA-382.
2	Washer, breather body screw, fiber $\frac{1}{4}$ "	RL-225.
1	*Washer, breather check	RA-380.

e. Carburetor guard.

1	Carburetor guard	RA-574-A.
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f. Connecting rod and piston group.

2	Bolts, connecting rod (Parkerized)	RA-89.
1	*Bushing, piston pin	RA-48.
1	*Connecting rod	RA-25-A.
1	Connecting rod and piston assembly	RA-2005-4.
1	Connecting rod assembly	RA-1025-1.
2	Nuts, SAE hex. cast., conn., rod bolts $\frac{1}{16}$ "	5-M.
2	Pin, cotter $\frac{1}{16}$ " x $\frac{1}{4}$ "	4-P-06.
1	Pin, piston	RA-27.
1	Piston	RA-5-1.
1	Ring, piston, oil retaining	RA-111.
2	Rings, piston, compression	RA-14.
2	Rings, piston pin retaining	RA-23-A.
2	Washers, connecting rod bolt (Parkerized)	RA-94.

*An item preceded by an asterisk should not be ordered individually but only as a part of the assembly to which it belongs.

g. Crankcase end plate group.

Number required	Item	Lauson part No.
1	Crankcase end plate assembly	RA-1076-3.
1	Crankcase end plate with RA-277 stud and RA-427 cup only.	RA-1076-4.
1	Cup, roller bearing (Timken) (also listed under crankcase group).	RA-427.
1	Gasket, crankcase end plate, thick	RA-121-A.
1	Gasket, crankcase end plate, thin	RA-246-A.
1	Gear, starter retard	RA-274-1.
1	Pin, cotter, $\frac{1}{8}$ " x $\frac{3}{4}$ "	8-P-06.
1	Plate, crankcase end	RA-64-C.
1	Retainer, felt washer	RA-133.
1	Spring, starter retard gear (Parkerized)	RA-280.
1	Stud, starter retard gear (Parkerized)	RA-277.
1	Washer, felt, oil seal	RA-167.
1	Washer, retard gear spring (Parkerized)	RA-415.

h. Crankshaft group.

1	Collar, spacing, on crankshaft	RA-40.
2	Cone, roller bearing, on crankshaft	RA-428.
1	Crankshaft	RA-24-10.
1	Crankshaft assembly	RA-1024-17.
2	Cup, roller bearing (Timken)	RA-427.
1	Gear, timing, on crankshaft	RA-12.
1	Key, Woodruff, $\frac{5}{16}$ " x $\frac{3}{4}$ ", starter gear	6-Y-6.
1	Nut, SAE hex. full $\frac{5}{16}$ " (Parkerized)	9-K.
1	Pin, timing gear	RA-103.
1	Washer, flywheel nut (Parkerized)	RA-645.

i. Cylinder group.

1	Cam and gear	RA-26-A.
2	Caps, intake and exhaust valve spring	RA-50.
1	Cover, valve spring	RA-19A.
2	Cups, intake and exhaust valve spring	RA-72.
1	Cylinder	RA-1-G.
1	Cylinder assembly	RA-5001-9.
1	Gasket, cylinder head	RA-114-B.
1	Gasket, valve spring cover	RA-217-A.
2	Guide, intake and exhaust valve	RA-197-A.
1	Head, cylinder	RA-4-C.
2	Inserts, valve seat	RA-945.
2	Key, intake and exhaust valve cap	RA-258-A.

Number required	Item	Lauson part No.
3	Lifters, intake and exhaust valve.....	RA-65-A.
9	Lockwasher, $\frac{5}{16}$ " main bearing studs (Parkerized)...	5-W.
2	Lockwasher, $\frac{5}{16}$ " valve spring cover screws (Parkerized).	5-W.
15	Nut, SAE hex. full, cylinder head studs and main bearing studs $\frac{5}{16}$ "-24 (Parkerized).	5-K.
2	Screw, USS hex. hd. cap $\frac{5}{16}$ " x $\frac{3}{4}$ " valve spring cover (Parkerized).	5-C-6.
1	Spark plug, Champion No. 7.....	RA-359.
2	Springs, intake and exhaust valve.....	RA-57-A.
1	Stud, cam gear.....	RA-28-A.
6	Stud, cylinder head (Parkerized).....	RA-68-A.
9	Stud, main bearing housing (Parkerized).....	RL-62.
3	Stud, starter bracket (Parkerized).....	RA-186.
1	Valve, exhaust.....	RA-66-A.
1	Valve, intake.....	RA-20-A.
6	Washer, cylinder head stud (Parkerized).....	RA-261.

j. Foot pedal starter group.

1	Bracket, starter.....	RA-189-A.
1	Clip, intermediate gear spring (Parkerized).....	RA-282-A.
1	Cotter pin, $\frac{1}{8}$ " x $\frac{3}{4}$ " starter retard gear spring.....	8-P-06.
1	Gear starter assembly.....	RA-1082-3.
1	Gear, starter on crankshaft.....	RA-275-A.
1	Gear, starter retard.....	RA-274-1.
1	Intermediate starter gear assembly.....	RA-1089-2.
1	Key, Woodruff, $\frac{3}{16}$ " x $\frac{3}{4}$ " starter gear (Parkerized)...	6-Y-6.
2	Key, Woodruff, $\frac{3}{16}$ " x $\frac{3}{4}$ " starter hinge member (Parkerized).	6-Y-6.
2	Lockwasher $\frac{3}{8}$ " (Parkerized).....	6-W.
3	Lockwasher $\frac{3}{8}$ " starter bracket studs (Parkerized)...	6-W.
1	Member, starter hinge.....	RA-191.
2	Nut, SAE hex. full $\frac{3}{8}$ " (Parkerized).....	6-K.
1	Nut, SAE hex. full $\frac{1}{2}$ " (Parkerized).....	8-K.
3	Nut, SAE hex. $\frac{3}{8}$ " full starter bracket stud (Parkerized).	6-K.
1	Pedal, starter foot.....	RA-190-A.
2	Pin, starter sector stop (Parkerized).....	RA-281-A.
1	Screw, fil. hd. mach. $\frac{3}{16}$ " x $\frac{3}{8}$ " (Parkerized).....	3-G-06.
2	Screw, SAE hex. hd. cap. $\frac{3}{8}$ " x 1- $\frac{1}{2}$ ".....	6-D-14.
1	Sector assembly, starter.....	RA-1271-1.
1	Sector, starter.....	RA-271-E.

Number required	Item	Lauson part No.
1	Shaft, starter (Parkerized)	RA-278.
4	Shim for RA-276 and starter bracket studs (Parkerized).	VW-36.
1	Sleeve, starter shaft (Parkerized)	RA-626.
1	Spring, intermediate gear (Parkerized)	RA-287.
1	Spring, starter retard gear	RA-280.
1	Spring, starter return— $\left\{ \begin{array}{l} SC-D- \\ 1652-B \\ \text{item 2} \end{array} \right\}$	$\left. \vphantom{\begin{array}{l} SC-D- \\ 1652-B \\ \text{item 2} \end{array}} \right\}$ RA-182-A.
1	Stud, intermediate starter gear	RA-276.
1	Stud, starter bracket (Parkerized)	RA-186.
1	Stud, starter retard gear	RA-277.
1	Stud, starter spring	RA-150-A.
2	Washer, No. 6 tinned steel bur (Parkerized)	6-AM.
1	Washer, plain $\frac{3}{8}$ " (Parkerized)	6-S.
1	Washer, plain $\frac{1}{2}$ " (Parkerized)	8-S.
1	Washer, starter retard gear spring	RA-415.

k. Governor assembly.

1	Bearing, ball, governor thrust	RA-481.
1	Cam and gear	RA-26-A.
2	Cotter pin, $\frac{1}{16}$ " x $\frac{1}{2}$ " governor ball	4-P-04.
1	Gasket, governor housing	RA-294.
1	Governor assembly	RA-1010-2.
2	Governor ball pins	RA-7-A.
2	Governor balls	RA-10-D.
1	Governor fork	RA-54-B.
1	Governor fork lever and shaft assembly	RA-1054-3.
1	Governor housing assembly	RA-1053-7.
1	Governor lever	LW-55-A.
1	Governor sleeve assembly	RA-1472.
1	Head, governor	RA-56.
1	Housing, governor fork	RA-53-G.
1	Lockwasher, cam gear stud, $\frac{3}{16}$ " (Parkerized)	9-W.
1	Nut, cam gear stud $\frac{3}{16}$ "-20 (Parkerized)	9-K.
1	Nut, jam $\frac{1}{2}$ "-20 (Parkerized)	8-N.
1	Screw, flat head 8-32 x $\frac{1}{2}$ "	8-32-AK-04.
1	Screw, speed regulating	RA-44-C.
1	Shaft, governor fork	RA-52.
1	Sleeve, governor	RA-472-D.
1	Spacer washer	RA-711.
1	Spring, lever return (Parkerized)	RA-58.

Number required	Item	Lauson part No.
1	Stud, cam gear.....	RA-28-A.
1	Stud, governor sleeve.....	RA-473.
1	Throttle rod.....	RA-490-C.

l. Louvre plate group.

1	Louvre plate assembly.....	RA-1235-9.
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m. Magneto group.

Number required	Item	Eisemann part No.
1	Brass strip for stator.....	24766.
1	Breaker cam, clockwise rotation.....	23410.
1	Breaker lever with contact rivet.....	24747.
1	Breaker plate less contact screw.....	23241.
1	Breaker plate with contact screw.....	23240.
1	Capacitor with mounting strap.....	23242.
1	Clip for holding winding.....	24233.
1	Fastening screw for breaker plate.....	17393.
1	Fiber wedge for winding.....	23268.
1	Flexible lead, breaker to capacitor.....	23280.
1	Hexagon nut for capacitor terminal.....	20131.
1	Hexagon nut for 22887 contact screw.....	22944.
1	High-voltage cable with terminal.....	24746.
1	Inspection hole cover.....	23020.
1	Insulating tubing for ground.....	24767.
1	Insulation strip for winding clip.....	23269.
1	Insulation washer for winding.....	23263.
1	Insulation washer for 22887 screw (small).....	22985.
1	Insulation washer for 22887 screw (large).....	23509.
1	Lock spring for breaker lever.....	24721.
1	Lock washer for capacitor terminal.....	9407.
1	Lock washer for 15298 hexagon nut.....	20975.
1	Lock washer for 17173 screw.....	15126.
1	Lock washer for 22944 hexagon nut.....	22615.
1	Low-voltage armored cable.....	24728.
1	Mounting screw for capacitor.....	17183.
1	Oil wick for breaker lever bearing.....	20484.
1	Plain washer for 17393 screw.....	9317.
1	Rotor with magnet and pole shoes.....	24769.
1	Screw for 24766 plate.....	18273.

Number required	Item	Eisemann part No.
1	Screw with tungsten contact point.....	22887.
1	Small insulating washer for winding.....	24750.
1	Solder clip for insulated primary.....	22214.
1	Stator assembly, complete.....	24742.
1	Stator plate with winding core only.....	24743.
1	Stator plate with winding only.....	24793.
1	Tension spring for breaker lever.....	24718.
1	Thrust washer for breaker cam.....	23411.
1	Winding, less core.....	23265.
1	.006" plain washer for 22671 lever.....	24723.
1	.016" plain washer for 22671 lever.....	24724.
1	.050" plain washer for 22671 lever.....	24722.
1	6-32 screw for 23020 cover.....	15137.

n. Main bearing housing group.

Number re-quired	Item	Lauson part No.
1	*Bearing cup (also listed under crankshaft group)....	RA-427.
1	*Bushing.....	RA-500.
4	*Bushing, bearing back plate.....	RA-485.
2	Gasket, main bearing housing.....	RA-126.
1	*Main bearing housing.....	RA-109-J.
1	Main bearing housing assembly.....	RA-1109-8.
1	Retainer, felt washer (also listed under crankcase end plate group).	RA-133.
1	Washer, felt, oil seal (also listed under crankcase end plate group).	RA-167.

o. Partial assemblies.

1	Choke lever assembly.....	04911.
1	Choke shaft and stop lever assembly.....	04865.
1	Float bowl cover assembly.....	04971.
1	Throttle lever assembly.....	06084.

p. Rope starter group.

1	Clip, magneto high-voltage wire (Parkerized).....	RA-487.
1	Key, flywheel.....	TL-88.
2	Lockwasher, 1/4" magneto screws (Parkerized).....	4-W.
3	Lockwasher, 5/16" starter pulley screws.....	5-W.

*An item preceded by an asterisk should not be ordered individually but only as a part of the assembly to which it belongs.

Number required	Item	Lauson part No.
1	Pulley, rope starter.....	TL-264-2.
3	Screw, fil. hd. $\frac{5}{16}$ "-18 x $\frac{3}{4}$ " (Parkerized) starter pulley.....	5-G-010.
2	Screw, hex. hd. cap. $\frac{1}{4}$ "-20 x $\frac{5}{8}$ ", magneto to engine (Parkerized).....	4-D-05.
1	Starter, rope assembly.....	RA-1585.
2	Washer, $\frac{1}{4}$ ", magneto screws (Parkerized).....	4-S.

q. Tillotson No. MS-110A carburetor group.

1	Carburetor complete, Tillotson No. MS-110A.....	RA-202-K.
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Number required	Item	Tillotson part No.
1	Body.....	06245.
1	Choke lever (with swivel attached).....	05994.
1	Choke lever clamp screw.....	0240.
1	Choke lever return spring.....	04122.
1	Choke lever swivel.....	05680.
1	Choke lever swivel screw.....	058.
1	Choke lever swivel washer.....	04920.
1	Choke shaft.....	04912.
1	Choke shutter.....	04863.
1	Choke shutter retaining screw.....	0120.
1	Choke stop lever.....	04106.
1	Choke stop lever retaining pin.....	03208.
1	Choke stop lever stop peg.....	05006.
1	Float.....	01459.
1	Float bowl cover.....	01794.
1	Float bowl cover gasket.....	01845.
4	Float bowl cover retaining screw.....	054.
4	Float bowl cover vent screw.....	01434.
1	Float bowl drain plug screw.....	02744.
1	Float cover retaining screw lockwasher.....	0992.
4	Float cover vent screw lockwasher.....	0759.
1	Float lever pinion pin.....	03369.
1	Idle adjustment screw.....	06077.
1	Idle adjustment screw locknut.....	02639.
1	Idle channel welch plug.....	03489.
1	Idle speed regulating screw.....	03257.

Number required	Item	Tillotson part No.
1	Idle speed regulating screw spring.....	0788.
1	Idle tube.....	06080.
1	Inlet connection.....	03453.
1	Inlet connection retaining screw.....	02409.
1	Inlet connection retaining screw gasket.....	02410.
1	Inlet connection screen.....	0802.
1	Inlet needle and seat.....	04050.
1	Inlet seat gasket.....	0337.
1	Main adjustment screw.....	06530.
1	Main adjustment screw clip.....	06526.
1	Main adjustment screw clip gasket.....	02510.
1	Main adjustment screw gland.....	06529.
1	Main adjustment screw gland gasket.....	02510.
1	Main adjustment screw packing.....	0705.
1	Main adjustment screw packing nut.....	0703.
1	Main nozzle.....	06075.
1	Main nozzle gasket.....	06076.
1	Throttle lever (with swivel attached).....	05994.
1	Throttle lever clamp screw.....	0240.
1	Throttle lever swivel.....	05680.
1	Throttle lever swivel screw.....	058.
1	Throttle lever swivel washer.....	04920.
1	Throttle shaft.....	05553.
1	Throttle shutter.....	04119.
1	Throttle shutter retaining screw.....	0120.
1	Throttle stop lever (with swivel attached).....	06125.
1	Throttle stop lever retaining screw.....	051.
1	Throttle stop lever stop pin.....	03517.
1	Throttle stop lever swivel.....	05680.
1	Throttle stop lever swivel screw.....	058.
1	Throttle lever swivel washer.....	04920.

r. Top sheet group.

2	Clips.....	RA-572-A.
1	Cylinder hood top sheet assembly.....	RA-1236-9.
10	Screws, cylinder hood USS hex. hd. $\frac{5}{16}$ "-18 x $\frac{1}{2}$ " with head drilled for sealing wire, for blower hsg. and top sheet (Parkerized).	RA-686-A.
8	Screws, cylinder hood, USS hex. hd. $\frac{5}{16}$ "-18 x $\frac{5}{8}$ " with head drilled for sealing wire, for carburetor shield (Parkerized).	RA-686.

46. List of replacement parts of Briggs and Stratton, model A, Nos. 208,072 and 208,097 engines.

Item	Briggs and Stratton part No.
Air cleaner assembly (Donaldson Co., Inc., part No. E351)	89062.
Air cleaner bowl assembly	89181.
Air cleaner cover and filter assembly	89182.
Air cleaner gasket	27038.
Air cleaner pipe	89141.
Air cleaner spacer	23458.
Armature	89054.
Armature lead insulator	65725.
Ball bearing	99157.
Base	21064.
Base gasket	66987.
Base screw	90887.
Bearing retainer lockwasher	91865.
Bearing sleeve washer	22006.
Bell crank bushing	63067.
Bell crank washer	62199.
Blower housing	21065.
Blower housing mounting bracket	62177.
Breather tube	69751.
Cam gear	61167.
Cam gear shaft	68333.
Cam shaft plug	68122.
Cap screw $\frac{5}{16}$ "-18 x $\frac{1}{4}$ " hex. hd.	EA101.
Cap screw	90950.
Cap screw	91028.
Capacitor	29652.
Capacitor	65735.
Carburetor assembly	89113.
Carburetor body	89114.
Carburetor body gasket	68857.
Carburetor elbow, Titeflex Metal Hose Co., part No. A4-5	91390.
Carburetor float	99622.
Carburetor gasket	68987.
Carburetor nozzle	23351.
Carburetor shield	22175.
Carburetor throttle valve	22036.
Center compression ring—standard	21202.
Center compression ring—0.010" oversize	21222.
Center compression ring—0.020" oversize	21223.
Center compression ring—0.030" oversize	21224.
Choke lever and swivel	89147.
Choke shaft bushing	23407.
Choke valve	22050.
Clutch retainer spring	26032.

Item	Briggs and Stratton part No.
Connecting rod.....	99790.
Connecting rod screw.....	92146.
Connecting rod screw head lock.....	22082.
Contact block assembly.....	89050.
Contact block connector plate.....	22172.
Contact block screw.....	23403.
Contact point and spring.....	69754.
Contact point screw.....	63238.
Contact point screw locknut.....	23402.
Contact spring block.....	65078.
Contact spring stop.....	22176.
Cotter pin (chains).....	92171.
Cotter pin (governor crank).....	7K47.
Cotter pin (governor throttle link).....	7K26.
Crankshaft.....	26203.
Crankshaft bearing.....	89061.
Crankshaft bearing sleeve.....	23176.
Crankshaft locknut.....	23175.
Cylinder.....	89055.
Cylinder head.....	21240.
Cylinder head gasket.....	69004.
Cylinder head spacer (flat).....	91324.
Cylinder head spacer (long).....	63336.
Cylinder head spacer (short).....	63337.
Cylinder head stud (long).....	23411.
Cylinder head stud (medium).....	23410.
Cylinder head stud (short).....	23409.
Cylinder shield.....	22142.
Dust cover clip.....	68876.
Exhaust pipe.....	23420.
Exhaust pipe clamp.....	21258.
Exhaust sleeve.....	23408.
Exhaust valve.....	23354.
Float hinge pin.....	23114.
Flywheel key.....	66403.
Flywheel nut.....	7J164.
Flywheel puller.....	29157.
Front air guide.....	22146.
Gasoline filter assembly, Zenith Carburetor Div., part No. F341.....	89119.
Gasoline line, Weatherhead Co., part No. 84479.....	89120.
Governor crank bushing.....	63492.
Governor gear.....	29374.
Governor lever.....	99917.

Item	Briggs and Stratton part No.
Governor shaft.....	63493.
Governor spring.....	66706.
Governor spring lever.....	89063.
Ground wire.....	66095.
Idler needle valve.....	23228.
Idler valve spring.....	26157.
Ignition cable.....	69789.
Inlet valve and seat.....	99636.
Inlet valve seat gasket.....	68877.
Intake elbow.....	21195.
Intake elbow locknut.....	23345.
Intake valve.....	68923.
Lockwasher.....	7A61.
Lockwasher.....	90366.
Lockwasher.....	90369.
Lockwasher.....	90969.
Lockwasher.....	92167.
Lockwasher, No. 6 shakeproof.....	92181.
Lockwasher, No. 8 standard.....	9199.
Lockwasher, No. 10.....	91285.
Lockwasher, $1\frac{1}{64}''$ x $\frac{5}{64}''$ x $\frac{1}{32}''$	92187.
Lockwasher, $1\frac{3}{64}''$ x $\frac{1}{16}''$ x $\frac{3}{64}''$	7T17.
Lockwasher, $\frac{1}{4}''$	92151.
Lockwasher, $\frac{1}{4}''$ x $\frac{3}{32}''$ x $\frac{5}{64}''$	90832.
Magneto flywheel.....	21268.
Magneto plate.....	89058.
Magneto plate air guide.....	89151.
Magneto plate assembly.....	89112.
Magneto plate gasket—0.005'' thick.....	66527.
Magneto plate gasket—0.009'' thick.....	66537.
Magneto plate gasket—0.015'' thick.....	66457.
Magneto plate mounting screw.....	92166.
Magneto point dust cover.....	65198.
Magneto point plunger.....	65414.
Muffler, Nelson Mufflet Corp., part No. 1244B.....	89144.
Needle adjusting valve.....	99621.
Needle valve packing.....	68887.
Needle valve packing nut.....	23227.
Needle valve packing washer.....	22032.
Nut.....	91208.
Nut, 8-32 hex.....	90570.
Nut, $\frac{1}{4}''$ —28 hex.....	90847.
Oil drain plug and chain.....	89044.
Oil filler cap and chain.....	89137.

Item	Briggs and Stratton part No.
Oil filler cap gasket.....	65938.
Oil filler nipple.....	89116.
Oil pump assembly.....	29569.
Oil pump body.....	29339.
Oil pump plunger.....	29340.
Oil pump spring.....	13A40.
Oil return valve.....	69817.
Oil ring—standard.....	61505.
Oil ring—0.010" oversize.....	61747.
Oil ring—0.020" oversize.....	61748.
Oil ring—0.030" oversize.....	61749.
Oil seal.....	99515.
Piston assembly—standard.....	99920.
Piston assembly—0.010" oversize.....	99967.
Piston assembly—0.020" oversize.....	99968.
Piston assembly—0.030" oversize.....	99969.
Piston pin lock.....	66246.
Piston pin—standard.....	65863.
Piston pin—0.005" oversize.....	63436.
Piston—standard.....	99963.
Piston—0.010" oversize.....	99964.
Piston—0.020" oversize.....	99965.
Piston—0.030" oversize.....	99966.
Retainer plate.....	22189.
Rivet.....	36436.
Rope starter pulley.....	21281.
Rubber bushing.....	65634.
Screw.....	90029.
Screw.....	90891.
Screw, ¼"—20 x ½" rd. hd.....	90916.
Screw, ¼"—20-⅝" hex. hd.....	91422.
Screw, ¼"—20-1" hed. hd.....	91456.
Screw, ¼"—20-1" rd. hd.....	92182.
Screw, ¼"—20-3" hex. hd.....	92195.
Screw, ¼"—29-1½" hex. hd.....	90889.
Screw, ⅝"—18-⅝" rd. hd.....	91556.
Screw, ⅝"—24 x ½" hex. hd.....	91648.
Screw, ⅝"—24 x ¾" fill. hd.....	92209.
Screw, ⅝"—24 x 1" hex. hd.....	20386.
Screw, 8-32 x ⅝" fill. hd.....	92017.
Screw, 8-32 x ½" fill. hd.....	90200.
Screw, 10-32 x ¼" fill. hd.....	92179.
Screw, 10-32 x ½" fill. hd.....	90202.
Screw, 10-32 x ⅞" rd. hd.....	91366.

Item	Briggs and Stratton part No.
Set screw, $\frac{5}{16}$ "—24 x $\frac{1}{2}$ " holl. hd.....	91758.
Spacer.....	52822.
Spark plug gasket.....	7B24.
Spark plug with gasket, Champion Spark Plug Co., part No. 6M, or Electric Auto-Lite Co., part No. B5.	7BC.
Spark plug wrench.....	68652.
Spring anchor screw.....	23412.
Spring hook.....	22198.
Spring tooth assembly; includes spring tooth and pin, spring, spring tooth retainer, and rivets.	99632.
Starter bracket.....	89102.
Starter bushing.....	23192.
Starter clutch assembly.....	89057.
Starter pedal assembly.....	89106.
Starter pinion.....	89100.
Starter ratchet case.....	21069.
Starter rope.....	66979.
Starter spring.....	26294.
Steel clutch ball.....	63770.
Strap, anchoring drain plug chain.....	22171.
Throttle lever.....	21152.
Throttle link.....	26275.
Throttle shaft assembly.....	99635.
Throttle shaft bushing.....	23230.
Throttle stop.....	61967.
Throttle stop and lever pin.....	23125.
Throttle stop spring.....	26119.
Top compression ring—standard.....	21203.
Top compression ring—0.010" oversize.....	21219.
Top compression ring—0.020" oversize.....	21220.
Top compression ring—0.030" oversize.....	21221.
Upper carburetor body.....	99954.
Upper carburetor body assembly.....	99772.
Valve cover plate.....	62154.
Valve cover plate gasket.....	65617.
Valve cover plate screw.....	91389.
Valve cover plate washer.....	590E.
Valve spring.....	65906.
Valve spring cup.....	62233.
Valve spring retainer collar.....	68283.
Valve spring retainer washer.....	68293.
Valve tappet.....	63277.

Item	Briggs and Stratton part No.
Venturi.....	21216.
Venturi gasket.....	68697.
Washer.....	13K3.
Washer.....	62976.

[A. G. 062.11 (5-19-41).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

E. S. ADAMS,
Major General,
The Adjutant General.

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R 7 (2); Bn 11 (5); IC and H 1, 6, 7 (3); IC 11 (5).
(For explanation of symbols see FM 21-6.)

